# WSS 1000

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# Product Reference Guide

*70-16192-03*
*Revision A*
*August 1999*

# *WSS 1000*
# *Product Reference Guide*

*70-16192-03*
*Revision A*
*August 1999*

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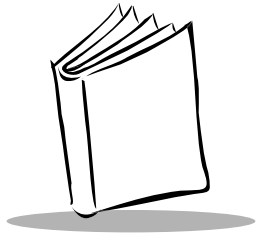

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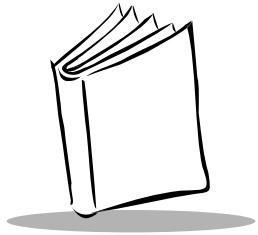
Tell Us What You Think...



# About This Manual

The *WSS 1000 Product Reference Guide* provides general information about the WSS 1000 wearable scanning computer system components and accessories for system administrators or programmers responsible for setting up the WSS 1000 system.

## Chapter Descriptions

Topics covered in this manual are:

- *Chapter 1, Getting Started* provides an overview of the WSS 1000 system including descriptions of components, options, and accessories.
- *Chapter 2, Cradle Setup and Battery Charging* covers mounting and connecting your CS 1000 Cradle, and charging batteries.
- *Chapter 3, Batch and Spectrum One Initialization* provides information specific to batch and Spectrum One environments.
- *Chapter 4, Spectrum24® RF Terminal Setup* provides information specific to Spectrum24 environments.
- *Chapter 5, Assembling the WSS 1000 System* includes instructions on assembling the wrist computer, ring scanner, and back-of-hand scanner on your arm.
- *Chapter 6, Operaing the WSS 1000* describes how to use the system, including powering on, warm and cold booting, using the keyboard and scanner, and communications.
- *Chapter 7, Maintenance and Troubleshooting* provides information on cleaning and maintaining the system, as well as error code indications and troubleshooting.
- *Appendix A, Specifications* provides technical specifications and scanner decode zone information.

- *Appendix B, WWC 1000 Keyboard* illustrates the various keyboard combinations provided by the WWC 1000.
- *Appendix C, Spectrum24 and Flash Disk Utilities* describes the supplemental utilites provided when working with the flash disk.

# Notational Conventions

The following conventions are used in this document:

- "Operator" and "User" refer to anyone using an application on a WSS 1000 system.
- "PC" refers to the IBM personal computer or compatible system that you are using to develop applications.
- WWC 1000 refers to the wrist computer.
- RS 1 refers to the ring scanner.
- WSS 1000 refers to the entire wearable scanning system.
- WS 1200 refers to the back-of-hand scanner.
- "You" refers to the system administrator, programmer, or operator using this manual as a reference aid.
- Keystrokes in bold type indicate non-alphanumeric keystrokes on the PC or on the terminal. For example:

  Select the **<F1>** key on the terminal to access on-line help.

- **Bold** type is used to identify menu items and input or text fields on a screen.
- *Italics* are used:
  - for the names of parameters in function prototypes and variable names in usage and syntax descriptions.
  - to highlight specific items in the general text.
  - to identify chapters and sections in this and related documents.
- Square brackets [ ] in a command line enclose optional inline parameters.
- Bullets (•) indicate:
  - action items
  - lists of alternatives
  - lists of required steps that are not necessarily sequential.
- Sequential lists (e.g., those that describe step-by-step procedures) appear as numbered lists.

# Related Publications

The following is a list of documents and publications that you may find useful if you want to know more about the WSS 1000 or about the tools and utilities that are available for writing applications.

## *Documents Available from Symbol Technologies*

- *WSS 1000 Quick Reference Guide,*
  p/n 70-16191-0X
- *RS 1 Quick Reference Guide,*
  p/n 70-16190-0X
- *WS 1200 Quick Reference Guide,*
  p/n 70-32646-0X
- *Series 3000 System Software Manual,*
  p/n 70-16310-0X
- *Series 3000 Application Programmer's Guide,*
  p/n 70-16308-0X
- *Series 3000 Application Programmer's Reference Manual,*
  p/n 70-16309-0X
- *Series 3000 Application Developer's Library,*
  p/n 70-16311-XX
- *CS 1000 Single-Slot Cradle Quick Reference Guide,*
  p/n 70-16237-0X
- *CS 1000 4-Slot Cradle Quick Reference Guide,*
  p/n 70-17661-0X
- *Novell LAN Workplace Reference Manual*
  p/n 70-20288-0X
- *Spectrum24 Ethernet Access Point User Guide,*
  *Spectrum24 Ethernet Access Point User Guide Addendum,*
  p/n 70-20183-XX
- *Spectrum24 STEP: Installation and Configuration Guide for Series 3000 Flash Disk Terminals*
  p/n 70-20343-XX.

# Service Information

If you have a problem with your equipment, contact the *Symbol Support Centers*. Before calling, have the model number, serial number, and several of your bar code symbols at hand.

Call the Support Center from a phone near the scanning equipment so that the service person can try to talk you through your problem. If the equipment is found to be working properly and the problem is symbol readability, the Support Center will request samples of your bar codes for analysis at our plant.

If your problem cannot be solved over the phone, you may need to return your equipment for servicing. If that is necessary, you will be given specific directions.

**Note:** *Symbol Technologies is not responsible for any damages incurred during shipment if the approved shipping container is not used. Shipping the units improperly can possibly void the warranty. If the original shipping container was not kept, contact Symbol to have another sent to you.*

## Symbol Support Centers

For service information, warranty information or technical assistance contact or call the Symbol Support Center in:

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1-800-653-5350

**Canada**

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905-629-7226

**United Kingdom**

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Symbol Place
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+44 118 945 7529 (Outside UK)

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Wear items and accessories having a Symbol serial number, will carry a 90-day limited warranty. Non-serialized items will carry a 30-day limited warranty.

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During the warranty period, Symbol will repair or replace defective products returned to Symbol’s manufacturing plan in the US. For warranty service in North America, call the Symbol Support Center at 1-800-653-5350. International customers should contact the local Symbol office or support center. If warranty service is required, Symbol will issue a Return Material Authorization Number. Products must be shipped in the original or comparable packaging, shipping and insurance charges prepaid. Symbol will ship the repaired or replacement product freight and insurance prepaid in North America. Shipments from the US or other locations will be made F.O.B. Symbol’s manufacturing plant.

Symbol will use new or refurbished parts at its discretion and will own all parts removed from repaired products. Customer will pay for the replacement product in case it does not return the replaced product to Symbol within 3 days of receipt of the replacement product. The process for return and customer’s charges will be in accordance with Symbol’s Exchange Policy in effect at the time of the exchange.

Customer accepts full responsibility for its software and data including the appropriate backup thereof.

Repair or replacement of a product during warranty will not extend the original warranty term.

Symbol's Customer Service organization offers an array of service plans, such as on-site, depot, or phone support, that can be implemented to meet customer's special operational requirements and are available at a substantial discount during warranty period.

## General

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Seller's liability for damages to buyer or others resulting from the use of any product, shall in no way exceed the purchase price of said product, except in instances of injury to persons or property.

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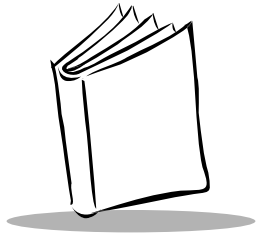


# Chapter 1
# Getting Started

## Introduction

The WSS 1000 is a modular wearable scanning system which allows the operator hands-free, unencumbered operation of a scanner and data collection device. The WSS 1000 consists of either a ring scanner (RS 1) worn on the operator's finger or a back-of-hand scanner (WS 1200), and a wearable wrist computer (WWC 1000) with display and keypad on the forearm, along with personal mounts.

The WWC 1000 is a DOS-based computer with decode and scanner-control capability, which optionally performs RF communications with an access unit. The wrist computer contains a battery which powers both the wrist computer and scanner. The system operates in full sunlight and low ambient light; LCD and keyboard backlighting is also provided.

The WSS 1000 system can be worn on either the right or left arm. The WWC 1000 and scanners are easily removed from their mounts allowing for interchangeable use by other operators.

As a batch terminal, the WWC 1000 collects and stores data for upload to a host computer. As a radio terminal, it incorporates a Spectrum One® or Spectrum24® wireless radio with an internally mounted antenna.

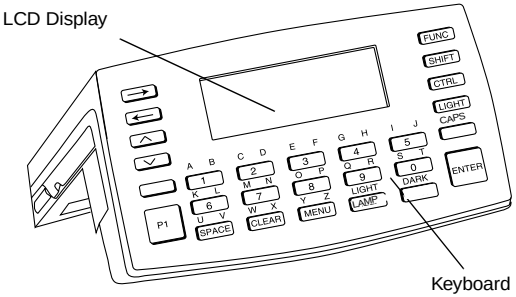
## Unpacking the System

To unpack the system components, carefully remove all protective material from around the unit. Save the shipping container for later storage and shipping. Verify that you received all equipment listed on the packing slip and inspect the equipment for damage. If you find any damaged or missing items, contact the Symbol Support Center immediately (see *Symbol Support Centers* on page xii for details).

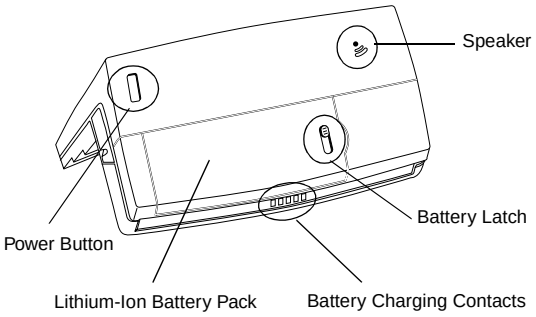
# Parts of the WSS 1000 System

## Wrist Computer (WWC 1000)

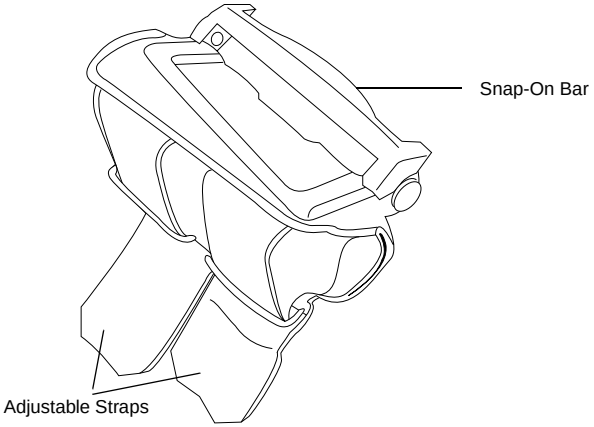
### Front View



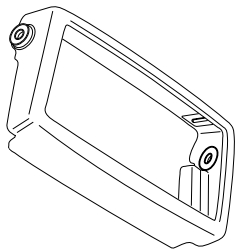

### Top View




### Wrist Mount

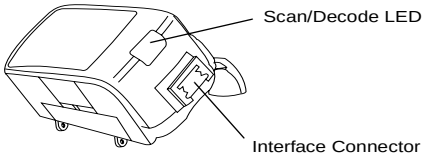



### Rugged Boot

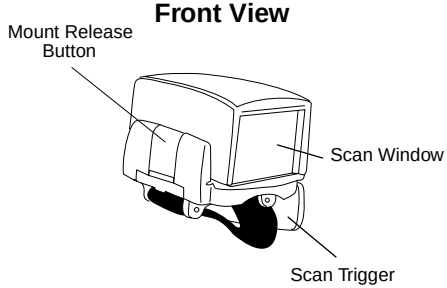


# RS 1 Scanner

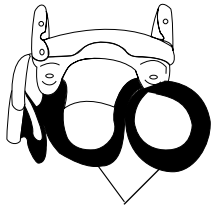
**Back View**



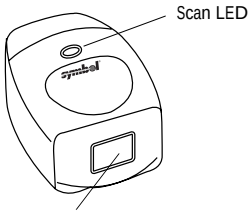

**Front View**



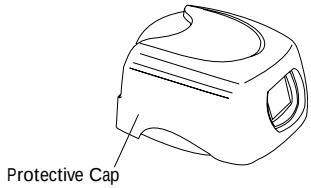

**Ring Mount**

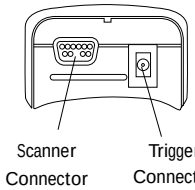


## WS 1200 Scanner

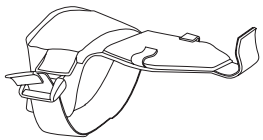



**Front/Top View**

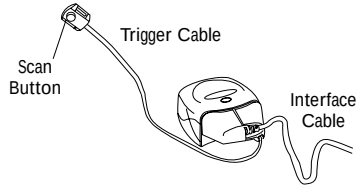



**Back View**



**WS 1200 Mount**




**Back View with Cables**

# *Component Descriptions*

## Wrist Computer

Detaches from scanner and provides for minimum breakaway force as safety feature. Controls scanner (e.g., laser power on, visual feedback, scanner connectivity), receives data from scanner, and transmits data via batch or radio communications. Includes interconnect cable.

## Wrist Mount

Worn on wrist or forearm of either arm. Detaches from wrist computer, which can then be used by other operators wearing their own wrist mounts.

## RS 1 Ring Scanner

Miniature laser bar code scanner, with trigger on thumb side of mount. Visual feedback for operator is provided through a 2-color LED on the back of the ring scanner.

## RS 1 Ring Mount

Worn on either hand using a strap which wraps around both the index and middle fingers, preventing the scanner from rotating on the finger during use. Detaches from ring scanner, which then can be used by other operators wearing their own ring mounts.

## WS 1200 Scanner

Laser scanner worn on back of hand, with thumb-activated cabled trigger. Scan LED on top of scanner provides operator feedback.

## WS 1200 Mount

Worn on either hand and includes “o-rings” to insert fingers to secure mount. Detaches from WS 1200.

## Keyboard

27-key keypad with alphanumeric and function keys. Left and right shift keys provide the equivalent of a 56-key keyboard.

## Lithium-Ion Battery Pack

User-replaceable 1300 mA Lithium-Ion battery pack, supporting a typical 8-hour work shift at 0 - 50° C. The pack powers both wrist computer and scanner and operates through a maximum of 500 full recharge cycles. The battery can be recharged using a CS 1000 cradle or a Universal Battery Charger with adapter.

# Radio and Network Options

## Spectrum One Network

The WWC 1010 includes an internal radio frequency transmitter/receiver for use in a Symbol Spectrum One network.

## Spectrum24 Network

The WWC 1040 includes an internal radio frequency transmitter/receiver for use in a Symbol Spectrum24 network.

# Accessories

The following accessories are available for the WSS 1000 System.

## Attachments

A rugged boot (p/n 21-19670-02) provides added protection for the wrist computer, and is used in place of the snap-on bar on the wrist mount. The WS 1200 is equipped with a protective cap.

## Cradles

The CS 1000 single-slot and 4-slot cradles function as both a communications device and a battery charger, and are the fastest means of charging the battery. The cradle is table-top or wall-mounted.

## UBC 1000 (Universal Battery Charger) and Adapter

This 4-battery charger is either desk-mounted or wall-mounted.

- UBC1000-400D (Desk Mount)
- UBC1000-400W (Wall Mount)
- Battery adaptor for WWC 1000 using UBC 1000 (p/n 50-12100-234).

### *Power Supply*

The following power supplies are available with the CS 1000 cradle:

| | |
|---|---|
| p/n 50-14000-045 | Powers one single-slot cradle |
| p/n 50-14000-052 | Powers one 4-slot cradle |
| p/n 50-14000-055 | Powers four 4-slot cradles |
| p/n 25-16657-01 | Adapter cable (used with four-cradle power supply). |

## Before You Use the WSS 1000 System

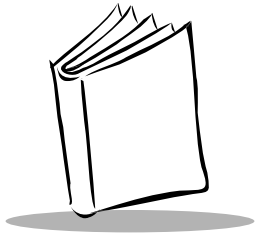
Before using the WSS 1000 system for the first time, perform the following procedures:

### *Install and Charge the Battery*

Charge the Lithium-Ion battery. The battery can be charged while in the wrist computer or separately in the cradle's charging slot. Refer to Chapter 2 for instructions on installing the cradle and charging the battery.

### *Load the Appropriate Software*

Initialize the WWC 1000 by loading the system software and applications. For batch applications or a Spectrum One network environment (1000 or 1010), refer to Chapter 3 for information on loading the software. For a Spectrum24 network environment (1040), refer to Chapter 4.



# Chapter 2
# Cradle Setup and Battery Charging

## Mounting the CS 1000 Cradle

The CS 1000 Single-Slot and 4-Slot Cradles may be mounted on a tabletop or wall mounted.

### *Table-Top Mounting*

The CS 1000 Single-Slot Cradle has a rear handle for desktop mounting.

To mount the CS 1000 4-Slot Cradle on the table top:

1. Place the mounting stand on a flat surface.
2. Place the cradle onto the stand so that the holes in the bottom of the cradle align with the bottom leg of the stand. The cradle should be tipped back at a slight angle.
3. Use two #6 screws (3/4" max. length) to secure the top of the cradle to the top of the stand.

### *Wall Mounting*

To make the connection process easier, connect the power supply to the cradle before mounting.

#### Single-Slot

An optional metal bracket is available from Symbol as part of a kit for mounting the single-slot cradle to a wall. Contact a Symbol sales representative to order.

## Four-Slot

To wall mount the CS 1000 4-Slot Cradle:

1. Place the empty cradle on the wall where it is to be mounted.
2. Insert two #8 screws through the holes in the outer spare battery compartments (Figure 2-1).
3. Insert two more screws through the holes on the lower portion of the cradle (between the first and second slot, and between the third and fourth slot).

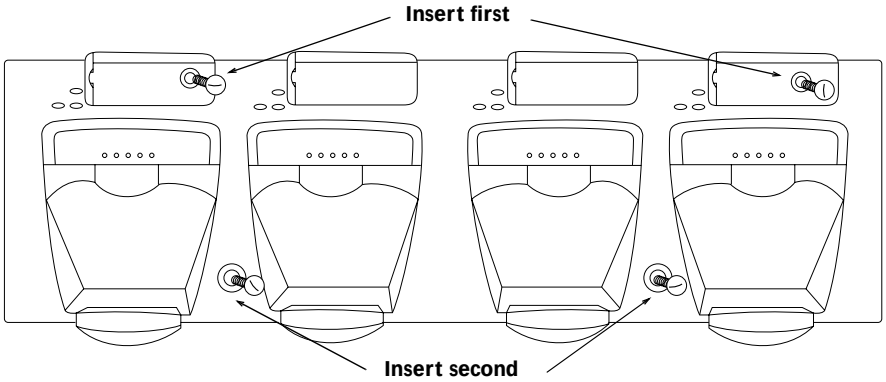
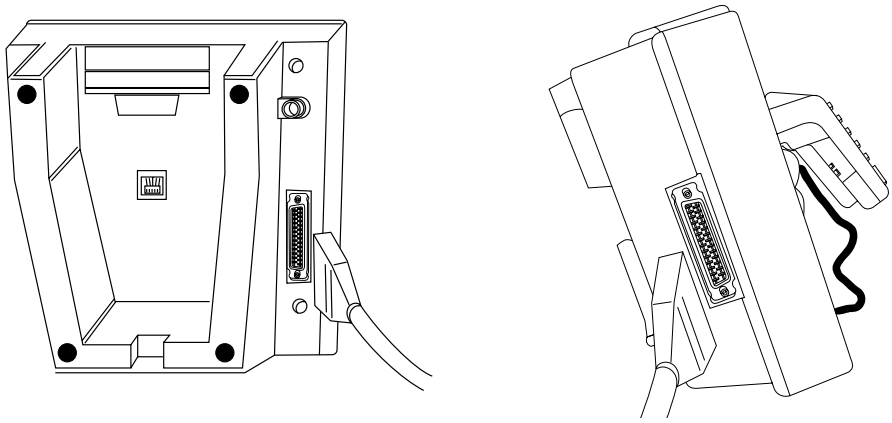



**Figure 2-1. Wall Mounting the 4-Slot Cradle**

# Connecting the Host and CS 1000 4-Slot Cradle

To connect the CS 1000 4-Slot Cradle to a host computer for communications:

1. Plug the RS-232 serial cable's DB-25 connector in the cradle's communication port. The port is located on the back right-hand side of the single-slot cradle, and on the left side of the 4-slot cradle.



**One Slot** **Four-Slot**

**Figure 2-2. Plugging Serial Connector into Single-Slot and 4-Slot Cradles**

2. Connect the cable's other DB-25 connector to the host's serial (COMM) port.
3. Connect the power supply cord's round connector to the cradle's power port (Figure 2-3).

   The single-slot cradle's power port is on the back right-hand side, above the communications port; use power supply p/n 50-14000-045.

The four-slot cradle's power port is in the center back; use power supply p/n 50-14000-052.

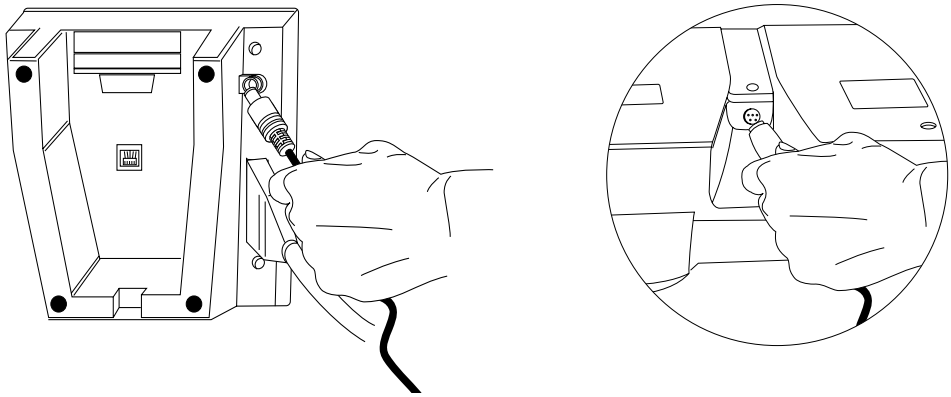



**Figure 2-3. Plugging Power Supply into Single-Slot and 4-Slot Cradles**

4. Connect an adapter cable to the other end of the power supply.

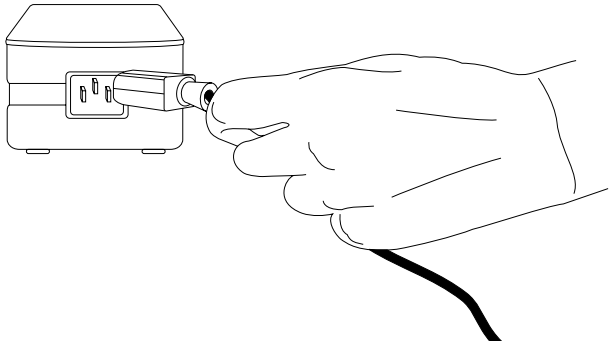


**Figure 2-4. Plugging Power Supply into Adapter Cable**

5. Plug the adapter cable into an electrical outlet.

## Connecting to Other Cradles

Up to 24 four-slot cradles can be daisy-chained together using the RS-232 inter-cradle cable (p/n 25-16740-01).

**Note:** *Single-slot cradles cannot be interconnected.*

*Caution*

Each cradle must receive power directly from a compatible power supply; any other method of power hookup is unsafe.

1. Plug one end of the inter-cradle cable into the cradle's communication port located on the right side of the first cradle.
2. Plug the inter-cradle cable's other DB-25 connector into the second cradle's communication port, located on the left side.
3. Connect a power supply to the second cradle as described in the previous sections.
4. Repeat the above steps for any additional cradles you wish to connect.

# Battery Charging

The WSS 1000's primary power is provided by a 1200 mAh Lithium-Ion battery pack.

## Battery Life

The approximate life of the battery pack between charges is a typical 8-hour shift @ 500 scans per hour. This time, however, is affected by many factors, including temperature, battery age, application, and data collection method. The following uses and operating conditions place a burden on the battery and shorten the battery's life:

- Scanning
- Radio communications
- Very high operating temperatures
- Very low operating temperatures.

The WSS 1000 powers down during periods of non-use, and powers on when scanning activity resumes (under application control).

## When to Replace or Recharge Batteries

The WSS 1000 provides two types of indicators to notify you when battery power is running low: warning messages and modified cursors. These indicators may be changed or disabled by an application.

- **LOW POWER** - When the battery is low, the cursor changes as shown in Table 2-1. Depending on the configuration (if ERR3000 is loaded), the message LOW BATTERY is also displayed. At this level, the wrist computer continues to operate, but there is probably less than 1 hour of usable power left.
- **VERY LOW** - When the power is very low, the DEAD BATTERY message is displayed and the system powers off. Replace or recharge the battery before attempting to use the wrist computer. If the battery is not immediately recharged or replaced, data may be lost.

**Table 2-1. Cursor Indicators**

| Keyboard State | Cursor Character | Low Battery |
|---|---|---|
| Unshifted | ∨ | ▼ |
| Shifted | ∧ | ▼ |
| Control | C | c |
| Alt | a | a |
| Function | f | f |
| Right | R | ▼ |
| Left | L | ▼ |

*The characters shown do not exactly match what will appear on your wrist computer's screen.*

### Supercap Power Backup

The wrist computer has a supercap power backup to prevent data loss during battery replacement. The supercap backup provides sufficient power to preserve memory contents for approximately 15 minutes while the batteries are replaced.

---

**Note:** *The supercap does not provide enough power to operate the wrist computer. Replace or recharge the primary batteries immediately upon receiving a dead battery message.*

---

## *Replacing Batteries*

To replace the Lithium-Ion battery pack (Symbol p/n 20-16228-02):

1. Power off the wrist computer.
2. Unlock and remove the battery compartment door.
3. Remove the spent battery pack.
4. Insert a fully-charged battery pack in the compartment.
5. Replace and lock the battery compartment cover.

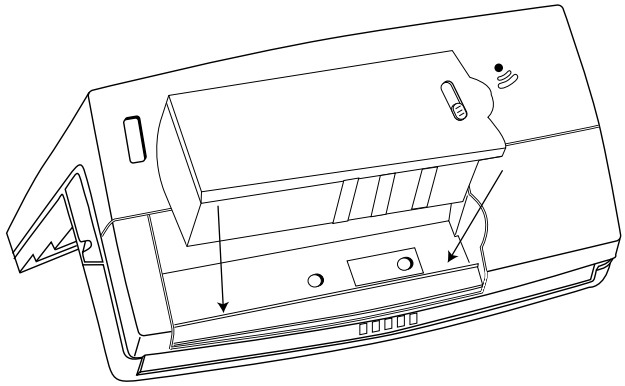


**Figure 2-5. Battery Compartment**

# Battery Charging

## Charging the Wrist Computer's Battery

To charge a Lithium-Ion battery in the CS 1000 Single-Slot or 4-Slot Cradle:

1. Verify that the cradle has power.
2. Slide the WWC 1000 in the cradle as shown in Figure 2-6 .
3. The WWC 1000's battery begins charging automatically.

The battery pack fully charges in approximately 120 minutes.

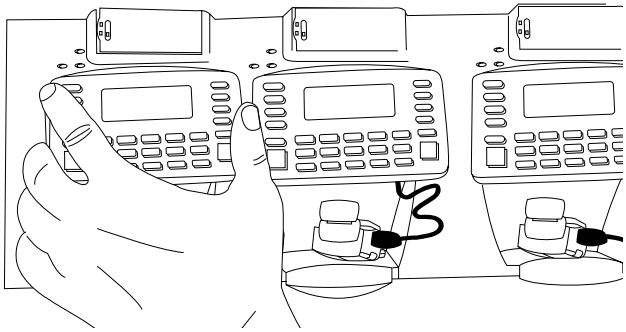


**Figure 2-6. Inserting Wrist Computer into 4-Slot Cradle**

## Charging the Spare (Auxiliary) Battery in the Single-Slot or 4-Slot Cradle

1. Verify that the cradle has power.

2. Lift the latch on the spare battery, and insert the battery in the cradle's charging slot. The latch snaps into place when the battery is inserted.

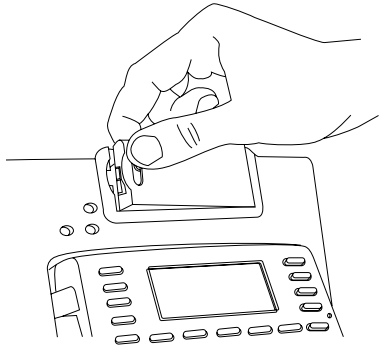


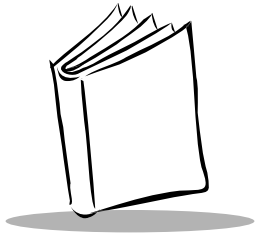
**Figure 2-7. Inserting Spare Battery in Cradle**

3. The spare battery is charged in approximately two hours, even if the WWC 1000 is charging at the same time.

## Battery Charging Tips

For maximum capacity and battery life:

- Charge at a temperature between $0^{o}$C and $45^{o}$C ($32^{o}$F and $113^{o}$F).
- Recharge as soon as you see the "Dead Battery" message.
- Charge Lithium-Ion batteries after storage.



# *Chapter 3*
# *Batch and Spectrum One Initialization*

## Communications

For wrist computers used in a direct communications (batch) environment or a Spectrum One network environment, applications are transferred from a host computer over a communications line to the wrist computer. This procedure uses the SENDHEX program on the host computer and the Program Loader function (from Command Mode) on the WWC 1000. Programs are stored in the wrist computer's nonvolatile memory (NVM), also called the application EEPROM.

---

**Note:** *For details on SENDHEX, refer to the Series 3000 Application Programmer's Manual.*

---

Other software may be used in place of SENDHEX.

# Set up for Initialization

1. Verify that the cradle is connected to the host PC. Refer to Chapter 2, *Cradle Setup and Battery Charging*.
2. Place the WWC 1000 in the cradle and power it off.

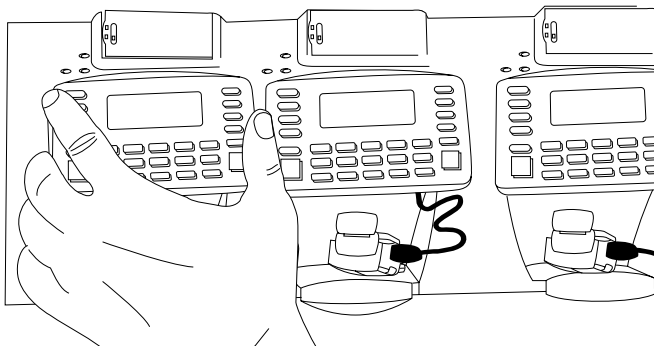


**Figure 3-1. Placing the WWC 1000 in the Cradle**

# Loading an Application

**Note:** *To cancel communications at any time during the session, press CLEAR on the WWC 1000. The session stops immediately.*

To download an application, initiate the communications software on the host computer and WWC 1000. The WWC 1000 must be connected to the host through a cradle to program the EEPROM.

**Note:** *Communication parameters specified on host and WWC 1000 must match. These parameters typically are:*

38400 bps
7 bit data
Odd parity
None

## Initiate Host Communications Software on the PC

1. Power on the host computer.
2. Start the communication program.
3. At a DOS prompt, enter the SENDHEX command:

   `sendhex` *`pgmname`* `38400 com2`

   where:

| | |
|---|---|
| SENDHEX | is the command. |
| pgmname | is the application being loaded (.hex extension is optional). |
| parameters | are the communications parameters following the program name. Parameters include baud rate, communications port, data bits, parity, and flow control. To accept the default parameters, do not enter a value. |

   In the example, baud rate is set to 38400 bps and communications port to COM2. The default values are accepted for the remaining parameters.

---

**Note:** *Versions of SENDHEX earlier than 3.0 do not support flow control. If you use an earlier version and encounter communication errors, use a lower baud rate. If you use a later version of SENDHEX and have communications errors, try setting flow control to XON/XOFF.*

---

4. SENDHEX displays the prompt:

```
Press <ENTER> to begin
communications.
```

5. Do NOT press **<ENTER>** yet. Before starting communications (refer to *Starting Communications* on page 3-5), set up the WWC 1000 for loading an application as directed in the following section.

## Initiate WWC 1000 Communications

To prepare to load an application onto the WWC 1000:

1. Boot the WWC 1000 to command mode.
   a. Press <**ENTER**> and **<FUNC**>.
   b. Press and release the **Power** button.

c. Release <**ENTER**> and <**FUNC**>. The function selector screen displays:

```
COMMAND MODE

Select function
Self Test
```

2. Scroll through the Command Mode options using **UpArrow** or **DownArrow** until "Program loader" displays. Press **<ENTER>**.
3. The WWC 1000 displays:

```
Program loader
WARNING: EEPROM
WILL BE ERASED
CONTINUE? <ENT>
```

Before loading the new application, erase NVM's original contents.

---

**Note:** *To cancel this operation, press <CLEAR>.*

---

4. Press <**ENTER**> to erase the EEPROM. When complete, the program prompts for the communications parameters.
5. **Baud Rate.**The WWC 1000 displays:

```
Comm Parameters

Baud
5      38400
```

Scroll through the list using **UpArrow** or **DownArrow**. When the correct rate is displayed (38400 is recommended), press **<ENTER>**.

6. **Data Bits.** The WWC 1000 displays:

```
Comm Parameters

Data Bits
7
```

Press **<7**> (recommended) or **<8>** to specify data bits, or scroll through the list using **UpArrow** and **DownArrow**. Press <**ENTER**> when the correct value is displayed.

**Note:** *If 8 data bits is selected, the program selects "No parity" and skips the next step.*

7. **Parity.** If 7 data bits is selected, the WWC 1000 displays:

```
Comm Parameters

Parity
Odd
```

   Press the first letter of a parity option (**E**ven, **O**dd, **N**one, **S**pace, or **M**ark), or scroll using **UpArrow** and **DownArrow** and press **<ENTER>** when the correct value is displayed.

8. **Flow Control.** The WWC 1000 displays:

```
Comm Parameters

Flow Control
None
```

   Press the first letter of a flow control option (**N**one, **X**on/Xoff, or **R**TS/CTS), or scroll using **UpArrow** or **DownArrow** and press **<ENTER>** when the correct value is displayed.

9. Go to *Starting Communications* to continue.

## Starting Communications

The WWC 1000 is ready to receive the program from the host PC and displays:

```
Comm Parameters

Start? <ENT>
```

1. Press **<ENTER>** on the WWC 1000. The WWC 1000 waits a few seconds for the host PC to initiate communications. While waiting, the WWC 1000 displays:

```
Comm Parameters

Receiving:
```

If the host is not ready or the cable is not connected between the host PC and cradle, the wrist computer displays:

```
Awaiting DSR
```

2. Press **<ENTER>** on the host computer. **SENDHEX** begins transmitting the program image. When communications are established, the WWC 1000 displays:

```
Program loader

Receiving: XXXX
```

where *XXXX* is the program segment address being transferred.

3. When the transmission is complete, the WWC 1000 displays:

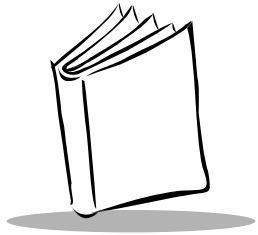
```
Program loader

Status 0000
```

A status of 0000 (all zeros) indicates a successful transfer. Other status values indicate an error. These values are provided in Appendix C.

## Ending Communications

To return to the Command Mode main menu:

1. Press **<CLEAR>** on the WWC 1000.
2. Power down the WWC 1000.
3. Remove the WWC 1000 from the cradle.
4. Reboot the WWC 1000 using the appropriate cold boot sequence described in *Booting the WWC 1000* on page 6-3.



# Chapter 4
# Spectrum24® RF Terminal Setup

## Spectrum24 Terminals

In Spectrum24 terminals, wireless connectivity is accomplished using standard communications protocols. Because they are standard, the protocols are generalized and take up considerably more space on the wrist computer's NVM than was required for Spectrum One® wrist computers. Because there is less space available in NVM for application files, the WWC 1040 operates with an additional megabyte of non-volatile memory or *flash disk*. This extra memory reduces not only the boot times but also the time and resources required to load applications into the wrist computer. The flash disk also offers the possibility of running multiple applications from the same WWC 1040 (see *Multiple Applications on the Same Wrist Computer* on page 4-15 for more information). With version 3.03 or later of the system software (LWP.HEX), the WWC 1040 can also run diagnostic tools.

### Accessing the Flash Disk

The flash disk is accessed through a driver, FLASHDSK.SYS, which makes the flash disk appear to a program as another disk drive (E:). The drive has characteristics of fast reading but slow writing (e.g., even for the smallest files, the write process takes 3 to 4 seconds), which make it ideal for files that are written once, accessed often, and seldom updated.

We recommend that you use the flash disk (E:) mainly for application and configuration file storage. It is important to note that because of the slow writing time (3 to 4 seconds), writing files during a power interruption (low battery, dead battery, suspend, power off, or power failure) could corrupt the disk. Be sure to only write data to the disk with the wrist computer connected to external power or with the battery fully charged to avoid problems. To avoid overwriting the flash disk by mistake, the flash disk is set to read-only mode for normal operation.

# Standard Spectrum24 Software

The WWC 1040 comes with the system software installed, including:

- Spectrum24 radio drivers
- TCP/IP software
- Configuration files
- Various utilities.

A BIOS of version 1.09 or later is required.

The default files cover most expected installations/initializations with minor changes as detailed in this chapter.

If your requirements are more advanced, refer to the *Spectrum24 Network Development Kit* documentation for more information on the Spectrum24 RF network, SLAODI.COM, the Symbol-provided ODI driver, and the configuration file setups required for various platforms.

# Boot Options & Internet Addressing

Each WWC 1040 requires a unique internet address (IP address), allowing messages it sends and receives to be correctly routed over networks conforming to the TCP/IP protocol standards. These addresses can be administered and entered manually, or administered and allocated by a server on the network.

By default, the WWC 1040 uses NOBOOT (manual entry) to define the IP address. To set the IP address, use the CFG24 utility described in *Initializing the WWC 1040* on page 4-3.

Two protocols are defined for the IP address allocation on the network: BOOTP and DHCP. To allocate IP addresses through BOOTP or DHCP, change the boot option in the configurator using the Boot Mode parameter.

# Initializing the WWC 1040

**Note:** *This section covers specific settings required on first booting the WWC 1040, out of the box. For a complete review of the CFG24 screens, refer to Appendix C, Spectrum24 Network and Flash Disk Utilities.*

To initialize a WWC 1040 which has *LWP.HEX version 3.03* or greater loaded:

1. Insert a charged battery in the WWC 1040. Refer to Chapter 2, *Cradle Setup and Battery Charging* for instructions on charging and installing a battery.
2. Cold boot the WWC 1040.
   a. Press <→ + **ENTER**>.
   b. Press and release the **Power** button.
   c. Release <→ + **ENTER**>.
3. The WWC 1040 loads software, then displays the Spectrum24 Configurator (CFG24) menu, shown in Figure 4-1.

**Note:** *On subsequent initializations, type CFG24 at the DOS prompt to bring up the configurator.*

```
CONFIGURATOR 1.XX
View config
params
Net Id
Subnet Mask
Default Router
Terminal IP
Address
Diversity
Terminal Sleep
Mode
Boot Mode
```

**Figure 4-1. CFG24 Main Menu**

On the WWC 1040 screen, the top and bottom lines of the menu are displayed, and the remaining lines are viewed by scrolling. In this menu, pressing <**CLEAR**> has the same effect as selecting *Exit*.

4. The WWC 1040 initially is set to NOBOOT mode. To configure the wrist computer for operation, set up the parameters provided in Table 4-1 (the procedures are detailed in the steps that follow).

**Table 4-1. Spectrum24 Configuration Parameters**

| | |
|---|---|
| **Net Id** | The Net Id identifies the radio network and differentiates between different radio networks. All equipment on one network must use the same Net Id.<br>Set to the same value specified for the Spectrum24 Access Points (APs). |
| **Boot Mode** | The boot mode indicates the source of the wrist computer's IP address. If this value is set to "Manual entry", you must enter a wrist computer IP address through CFG24. |
| **Terminal IP Address** | Required if you are not using a boot server to allocate IP addresses (BOOTP or DHCP).<br>Set as advised by your LAN administrator.<br>**Note:** Take care entering this value! The IP address must be unique in the network or communications will be unpredictable. |
| **Subnet Mask** | Set as advised by your LAN administrator.<br>**Note:** If you change boot mode, the value set by a server overrides this value. |
| **Default Router** | The default router is the address of the node where all packets destined for remote networks will be sent.<br>Set as advised by your LAN administrator.<br>**Note:** If you change boot mode, the value set by a server overrides this value. |
| **Diversity** | Determines whether the radio firmware attempts to use one or two antenna ports for communications. It is important to match this setting with the actual number of antennas in use.<br>If set to "Yes", the radio firmware attempts to use both antenna ports for communications.<br>The WWC 1040 has one antenna. Set to "No". |

**Table 4-1. Spectrum24 Configuration Parameters (Continued)**

| | |
|---|---|
| **Terminal Sleep Mode** | Determines whether radio is powered off after the wrist computer enters sleep mode due to inactivity. Refer to Appendix D for more information.<br>The default value is "On". |
| **Power Management** | If power management is set to PSP, the radio powers up only when there is traffic on the network. If it is set to CAM, the radio is always ready to receive. Use the PSP setting to save battery life.<br>The default value is "PSP". |

a. To view the WWC 1040's default parameters, select VIEW CONFIG PARAMS (Figure 4-2).

This screen is for display only; it is not a data entry screen. Use it to review the wrist computer's IEEE (or MAC) address, IP address, and Net Id. Press <**CLEAR**> or <**ENTER**> to return to the main menu.

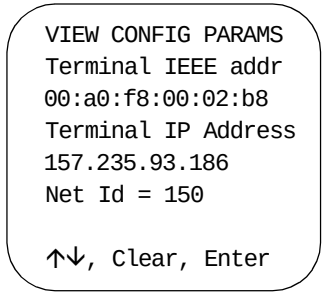



**Figure 4-2. View Configuration Parameters Screen**

b. To change the Net Id, select **Net Id** from the CFG24 Menu. The *Net Id* screen is displayed.

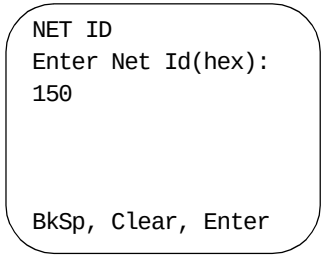



**Figure 4-3. Net Id Screen**

To change the current Net Id value, backspace over the current value and type a new value, in hexadecimal format, in the range 101 to 1FE. Alphabetical hex values can appear in upper or lower case.

Press <**ENTER**> to effect the change. Press <**CLEAR**> to exit without changes.

c. Select **Subnet Mask** from the main configuration menu. The *Subnet Mask* screen is displayed.

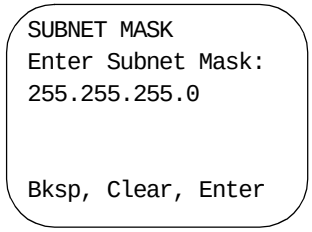



**Figure 4-4. Subnet Mask Screen**

To change the current Subnet Mask setting, backspace over the current value and type a new value, in decimal form. Each part of the four-part address must be in the range 0 to 255.

Press <**ENTER**> to effect the change. Press <**CLEAR**> to exit without changes.

d. Select **Default Router** from the main configuration menu. The *Default Router* screen is displayed.

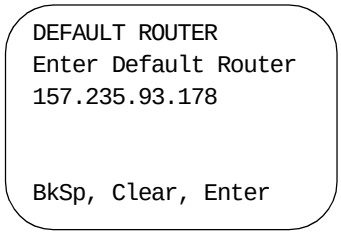



**Figure 4-5. Default Router Screen**

To change the current Default Router setting, backspace over the current value and type a new value, in decimal form. Each part of the four-part address must be in the range 0 to 255.

Press <**ENTER**> to effect the change. Press <**CLEAR**> to exit without changes.

e. Select **Terminal IP Address** from the main configuration menu. The *Terminal IP Address* screen is displayed.

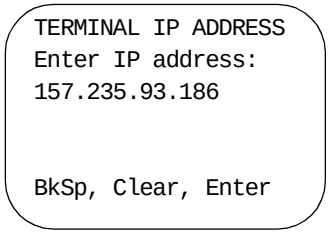



**Figure 4-6. Terminal IP Address Screen**

To change the current Terminal IP Address, backspace over the current value and type a new value in decimal form. Each part of the four-part address must be in the range 0 to 255.

Press <**ENTER**> to effect the change. Press <**CLEAR**> to exit without changes.

f. Select **Diversity** from the main configuration menu. The *Diversity* screen is displayed.

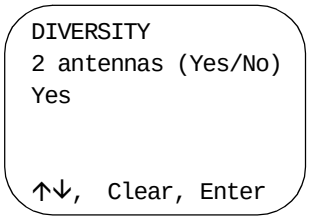



**Figure 4-7. Diversity Screen**

To change the current Diversity setting, use the ↑↓cursor keys to toggle between the settings “Yes” and “No”. For the WWC 1040, set Diversity to “No”.

Press <**ENTER**> to effect the change. Press <**CLEAR**> to exit without changes.

g. Select **Terminal Sleep Mode** from the main configuration menu. The *Terminal Sleep Mode* screen is displayed.

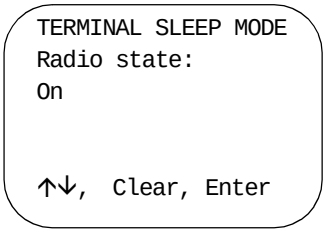



**Figure 4-8. Terminal Sleep Mode Screen**

To change the current Terminal Sleep Mode, use the ↑↓ cursor keys to toggle between the “On” and “Off” settings. The default setting is “On”.

Press <**ENTER**> to effect the change. Press <**CLEAR**> to exit without changes.

h. Select **Boot Mode** from the main configuration menu. The *Boot Mode* screen is displayed.

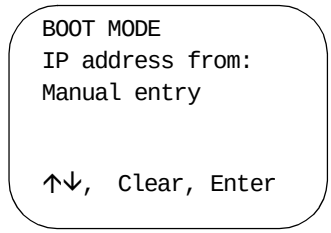



**Figure 4-9. Boot Mode Screen**

To change the current boot mode, use the ↑↓ keys to toggle among the three settings: "Manual entry", "BOOTP", and "DHCP". Refer to Appendix C, *Spectrum24 Network and Flash Disk Utilities* for a complete explanation of the three boot modes.

Press <**ENTER**> to effect the change. Press <**CLEAR**> to exit without changes.

i. Select **Power Management** from the main configuration menu. The *Power Management* screen is displayed.

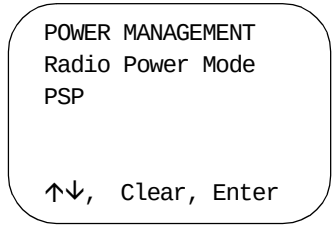



**Figure 4-10. Power Management Screen**

To change the current power management mode, use the ↑↓ keys to toggle between the settings "PSP" and "CAM". The default setting is "PSP".

Press <**ENTER**> to effect the change. Press <**CLEAR**> to exit without changes.

5. When all of your changes are made, press <**CLEAR**> to return to the main configuration menu.
6. Select *Exit* from the main configuration menu and press <**ENTER**> to exit the configurator.

The WWC 1040 displays the message:

```
...updating config
data
```

and proceeds with the initialization which writes the configuration values to a R/W non-volatile section of radio flash memory.

## *Initiating Network Connection*

As the initialization continues, the wrist computer attempts to associate with the Spectrum24 AP using the default or newly entered Net Id.

### WWC 1040 Association with AP Not Successful

If the WWC 1040 is unable to associate with the AP (the Net Id is wrong or forgotten), it displays the message:

```
STAT24 Ver 1.XX
NOT Associated
```

for a few seconds. A second message follows:

```
Terminal cannot associate with AP. You're
out of range or not configured. Ctrl+C to end
or other key to retry. Strike any key when
ready.....
```

The WWC 1040 continues trying to connect until the attempt is cancelled.

1. Press <**Ctrl** + **C**> to end the attempt. The WWC 1040 displays the message:

   ```
   Halt Batch process Y/
   N?
   ```

2. Type **Y** to exit to the DOS prompt (D:).
3. At the DOS prompt, type **CFG24** and press <**ENTER**> to initiate the Configurator and display the Configurator screen.
4. Verify the Net Id with the LAN administrator to ensure you are entering the correct value.
5. Verify other parameters and proceed as directed in *Initializing the WWC 1040* on page 4-3, beginning with step 4a.

### WWC 1040 Association with AP Successful

If the association is successful, the wrist computer begins operating using the software files loaded on the flash disk.

On first initialization, you probably don't have applications loaded. Proceed with loading the applications as directed in *Installing Application Software on Flash Disk* on page 4-11.

On subsequent initializations, if only one application is loaded, that application is displayed automatically. If you loaded multiple applications, an application selection menu is displayed early in the initialization process. Select the application to load for the current session and proceed.

# Installing Application Software on Flash Disk

> **Note:** *LWP.HEX version 3.03 or greater is required on the WWC 1040 for this process. If you are not sure of the wrist computer's hex version, boot (initialize) the WWC 1040. The hex version is displayed for approximately 5 seconds during the initialization process.*

Installing application software on the WWC 1040 flash disk includes downloading a HEX file to the WWC 1040, using **SENDHEX** on the PC and **Program Loader** on the wrist computer, and re-initializing the wrist computer. On the initial boot after a software download, the WWC copies the software files on to the flash disk, and remembers that the copy occurred, ensuring that it is not repeated each time the WWC is booted.

The hardware required for performing the download includes:

- WWC 1040 wrist computer
- CS 1000 1- or 4-slot cradle with power supply
- DOS PC
- RS-232 serial null modem cable.

## *Initiate Host Communications on the PC*

To update the hex image:

1. Power on the host PC.
2. On the host PC, change to the directory where the application's hex file is stored and type the following command at a DOS prompt:

```
SENDHEX <hexfile> 384 [1|2]<ENTER>
```

where:

| | |
|---|---|
| SENDHEX | is the command |
| <hexfile> | is the hex file for the application being loaded. There may be other application hex files which load other software (e.g., STEP version 2.6.0 or greater, or TelNet Clients 3.0 or greater) to the flash disk.<br>**Note:** Be sure to use applications that are flash-disk enabled. |
| 38400 | is the baud rate. |
| [1\|2] | sets the host communications port the cradle is attached to. |

The following message is displayed:

```
Press <ENTER> when remote is ready. ESC to abort...
```

3. Do NOT press <**ENTER**> yet. Set up the WWC 1040 as described in *Initiate WWC 1040 Communications*.

## Initiate WWC 1040 Communications

1. Place the WWC 1040 in the cradle and power it off.
2. Boot the WWC 1040 to command mode.
   a. Press <**ENTER**> and **<FUNC**>.
   b. Press and release the **Power** button.
   c. Release <**ENTER**> and <**FUNC**>. The function selector screen displays:

```
COMMAND MODE

Select function
Self Test
```

3. Scroll through Command Mode options using ↑ or ↓ until “Program loader” is displayed. Press **<ENTER>**.
4. The WWC 1040 displays:

```
Program loader
WARNING: EEPROM
WILL BE ERASED
CONTINUE? <ENT>
```

**Note:** *To cancel this operation, press <CLEAR>.*

5. Press <**ENTER**> to erase the EEPROM. When complete, the program prompts for the communications parameters.
6. Set the parameters to 38400 bps, 7 data bits, odd parity and no flow control. Press <**ENTER**>.

## Start Communications

1. The WWC 1040 displays:

```
Comm Parameters

Start? <ENT>
```

2. Press **<ENTER>** on the WWC 1040.
3. The WWC 1040 displays:

```
Comm Parameters

Receiving:
```

   If the host is not ready or if the cable is not connected properly between the host PC and the cradle, the WWC displays:

```
Awaiting DSR
```

4. Press <**ENTER**> on the host PC to start the download. The wrist computer displays:

```
Program loader

Receiving: XXXX
```

   where XXXX indicates the download's progress.

5. When the transmission is complete, the WWC 1040 displays:

```
Program loader

Status 0000
```

   A status of 0000 (all zeros) indicates a successful transfer. If the status is other than 0000, check the cable connections between the host PC and the cradle and repeat the process. If the problem persists, contact the Symbol Support Center for assistance.

6. After the download to each wrist computer is complete, re-initialize (cold boot) the WWC 1040 to finish copying the system files to the flash disk.

---

**Note:** *The WWC 1040 must be re-initialized to ensure the files are copied to the flash disk.*

---

# Updating System Software on Flash Disk

To update the LWP hex image, load the new system files on the flash disk using the SENDHEX utility on a PC. This update can be performed on multiple wrist computers in a cradle at one time, with each wrist computer running Program Loader from Command Mode.

---

**Note:** *The WWC 1040 is shipped with the LWP hex file installed. Use this procedure ONLY:*

- *to load a new version of LWP greater than 3.03*
- *if you experience serious difficulties*
- *if you are so directed by Symbol's Technical Support staff.*

---

1. Following the instructions for installing software on the flash disk (through step 5). Be sure, when entering the SENDHEX command on the PC, to issue the command from the directory where the hex file (LWP.HEX) is stored.

   When the download is complete, the WWC 1040 displays the following query:

```
LWP.HEX Ver X.XX
Loading system files
1. Reformat flash
2. Use flash as-is
Select [1,2]:
```

---

**Note:** *Reformatting the flash removes all files stored on the flash disk.*

---

2. Select **1, Reformat flash**, ONLY if you have problems with the WWC 1040's operation.

*Caution*

This removes the system software and all applications!

Select **2, Use flash as-is**, to update the flash while retaining the existing contents.

3. If you select 1, the WWC displays the message:

```
Are You sure Y or N
```

4. Press **Y** to continue with the reformat or **N** to cancel and press <**ENTER**>.

   The WWC 1040 finishes reformatting (if requested), copies the files to the flash disk, and executes them.

## Multiple Applications on the Same Wrist Computer

The system files (from LWP.HEX) fill over 200 KB of the flash disk's 1 MB. Current standard applications such as STEP or TN clients require between 100 KB and 150 KB of flash disk. This leaves ample space for installing more than one application on a single WWC 1040. Wrist computers have been configured to run as many as four applications, with a maximum of five applications allowed.

Individual applications may require special configurations that can only be set at boot time, such as RAM disk size. The TN clients require configuring a minimum-size RAM disk (<100 KB) because their limiting resource is program execution space. STEP, on the other hand, uses the RAM disk to hold forms. Some STEP application implementations use forms extensively and require a larger RAM disk (>100 KB). The application loaded last defines the size of the RAM Disk for all applications on the flash disk.

---

**Note:** *The system files contained in the LWP.HEX have the RAM disk defined as 80 KB.*

---

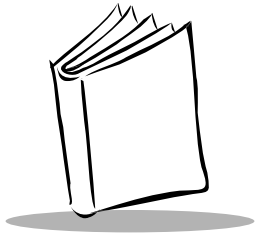
---

**Note:** *It is possible with multiple applications to have applications co-existing on the wrist computer with conflicting memory requirements. If this occurs, work out a compromise value that both applications can work with before loading the files.*

---

If multiple applications are installed on the WWC 1040, a menu is presented during the initialization process where you select the application to run for this session. Switching

between applications requires re-initializing the wrist computer and selecting an alternative application when prompted. On warm boots, the wrist computer re-initializes and re-enters the same application that was selected before the re-initialization. On cold boots, if there are multiple applications available, an application selection menu is presented.



# *Chapter 5*
# *Assembling the WSS 1000 System*

The WSS 1000 assembly consists of the WWC 1000 and mount together with a scanning component, the RS 1 ring scanner, or WS 1200 back-of-hand scanner.

## Assembling the WWC 1000 (Standard Unit)

1. Orient the cable on the WWC 1000 for right or left-handed operation.
2. Ensure that the cable is fully seated in the channel.

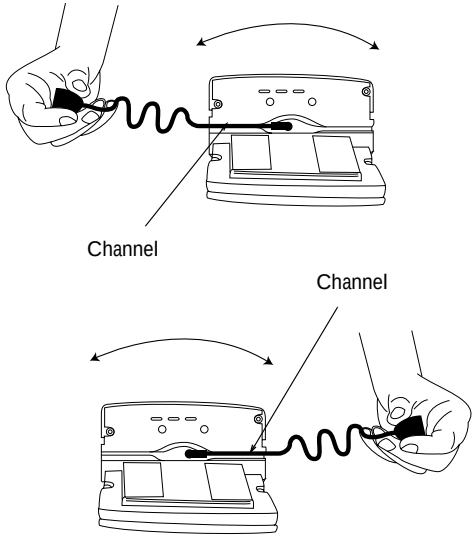



**Figure 5-1. Orienting the Cable on the WWC 1000**

3. Place the WWC 1000 wrist computer onto the wrist mount, facing you. Be sure the mount is oriented so that the longer strap will be further up the forearm.
4. Snap the bar over the WWC 1000 using the snaps on either side of the mount. The straight part of the bar lies across the front of the WWC 1000, with the curved part in back.

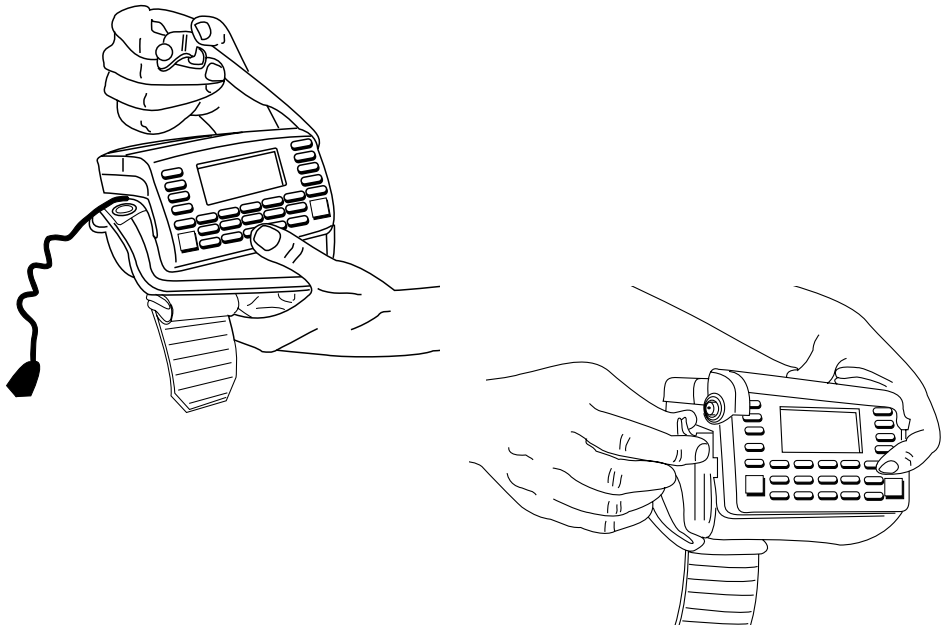


**Figure 5-2. Snapping the Bar Over the WWC 1000**

---

**Note:** *The snaps on the wrist mount act as a tear-away device allowing the wrist computer to detach from the mount if it catches on an object.*

---

# Assembling the WWC 1000 (Rugged Boot Option)

When using the WSS 1000 in harsher conditions, a rugged boot mount may be ordered. To assemble the WWC 1000 with the rugged boot:

1. Orient the cable on the WWC 1000 for right or left-handed operation.
2. Ensure that the cable is fully seated in the channel (Figure 5-1).
3. Orient the WWC 1000 so that the longer strap will be further up the forearm and the keyboard is facing you. If necessary, rotate the protective sleeve attached to the mount to accomplish this.

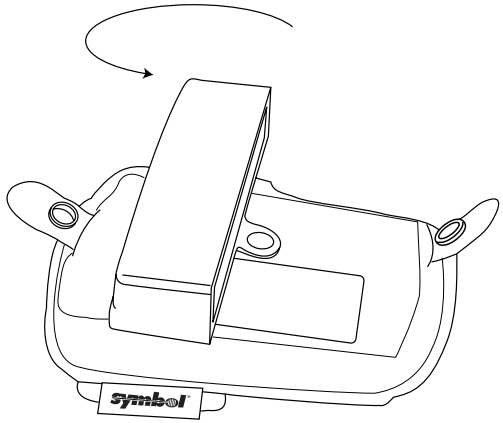



**Figure 5-3. Rotating Protective Sleeve on Mount**

4. Place the WWC 1000 wrist computer onto the wrist mount by sliding it into the protective sleeve.

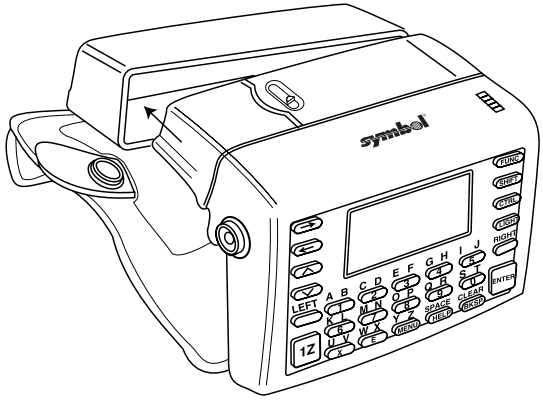



**Figure 5-4. Sliding WWC 1000 into Sleeve**

5. Snap the mount straps onto the WWC 1000 to secure.

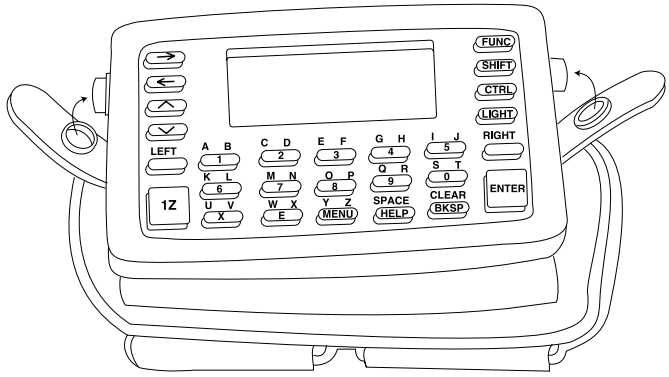



**Figure 5-5. Snapping Mount Straps on the WWC 1000**

# Assembling the Ring Scanner

1. Adjust the strap of the ring mount to fit your right or left index and middle fingers:
   a. Slip the mount onto your right or left index and middle fingers, oriented so the trigger is next to your thumb.

**Figure 5-6. Placing the Ring Mount on Fingers**

   b. If necessary, adjust the strap so that the mount fits comfortably.

**Figure 5-7. Adjusting Strap**

   c. Remove the mount.
2. Insert the ring scanner in the ring mount, depending on right or left-handed use.
   a. Determine whether the scanner will be used on a right or left arm.
   b. Orient the ring scanner to the mount so that the trigger is next to the your thumb.

c. Slide the ring scanner backwards into the mount.

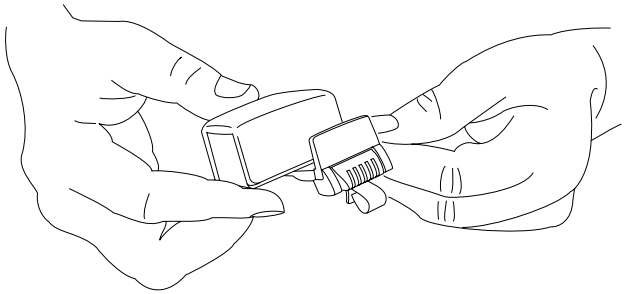


**Figure 5-8. Sliding the Ring Scanner into the Mount**

3. Plug the cable connector from the WWC 1000 in the interface port on the back of the ring scanner, with the arrow on the top of the cable facing up.

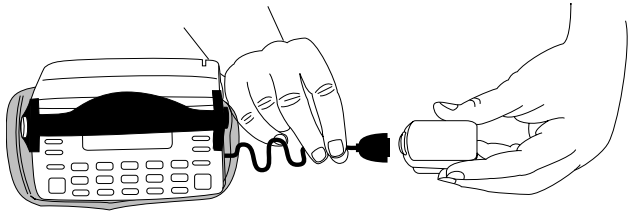


**Figure 5-9. Connecting Cable from WWC 1000 to Ring Scanner**

## *Wearing the WSS 1000 System with the Ring Scanner*

To assemble the WSS 1000 system with the ring scanner on your arm and hand:

1. Slide the wrist mount on your arm, so that the longer strap is further up your arm.

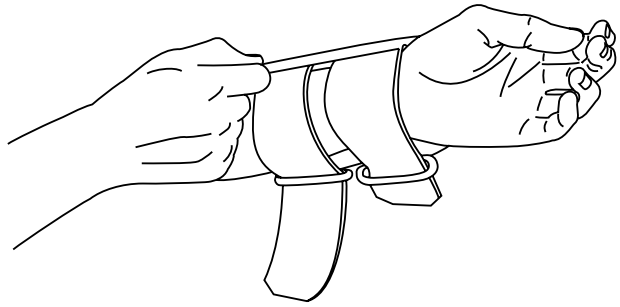


**Figure 5-10. Sliding Wrist Mount Onto Arm**

2. Pull the straps through the buckles so the mount is secure but not tight.

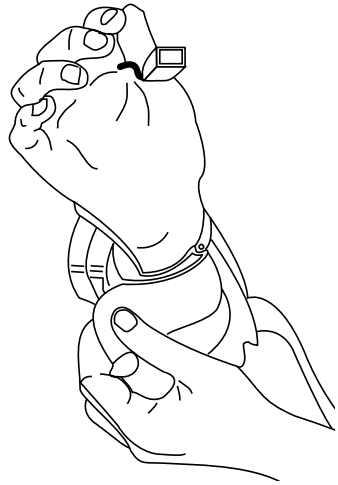


**Figure 5-11. Adjusting Straps on Wrist Mount**

3. Use the Velcro to secure the straps.

4. Slide the ring mount and ring scanner on your right or left index and middle fingers with the trigger next to your thumb.

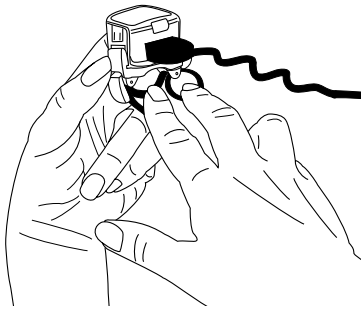


**Figure 5-12. Sliding Ring Mount and Scanner Onto Finger**

## *Removing the Ring Scanner*

To remove the ring scanner for use by another operator:

1. Remove the cable from the scanner's interface port by snapping the connector out to the side.
2. Press the mount release button and gently pull/push the ring scanner out of the mount.

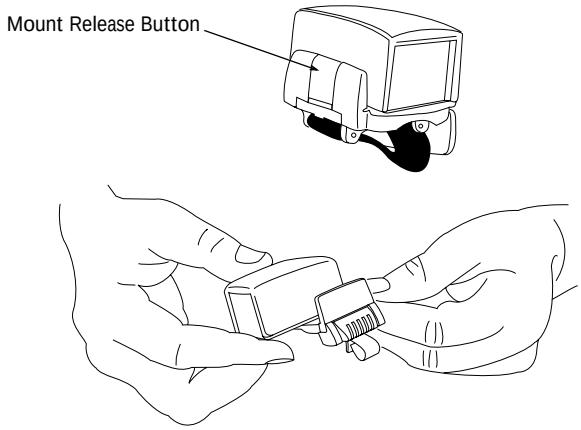



**Figure 5-13. Removing the Ring Scanner from the Mount**

# Assembling the WS 1200 Scanner

The WS 1200's mount can be used by both right and left-handed users.

**Note:** *Verify that the WSS 1000 has the correct data cable, shown below, for use with the WS 1200 scanner.*

**Figure 5-14. WS 1200 Data Cable**

1. Assemble the WWC 1000 wrist computer in the mount as directed in *Assembling the WWC 1000 (Standard Unit)* on page 5-1.
2. Plug the trigger cable in the scan port on the back of the scanner.

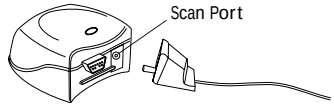



**Figure 5-15. Inserting Trigger Cable**

3. Plug the data cable from the WWC 1000 in the interface port on the back of the WS 1200 scanner. The data cable connector is molded to fit next to the trigger cable connector.

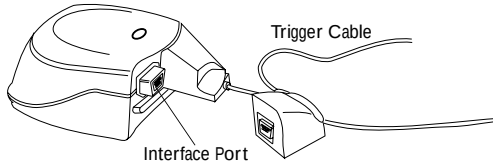



**Figure 5-16. Inserting Data Cable**

4. Place the WS 1200 on the mount, securing with the velcro.

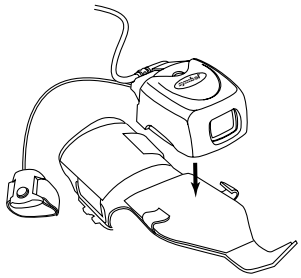


**Figure 5-17. Placing WS 1200 onto Mount**

## *Wearing the WSS 1000 System with the WS 1200 Scanner*

1. Slip the WS 1200 mount's strap through the buckle as shown below to create a loose loop.

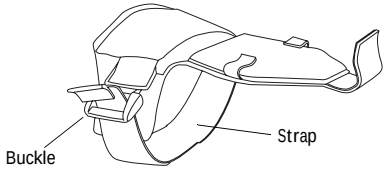



**Figure 5-18. Buckling Mount Strap**

2. Slide the wrist unit on your right or left arm as directed on page 5-7.
3. Insert your hand through the scanner mount.

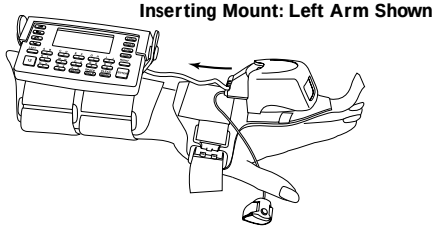



**Figure 5-19. Inserting Hand in Mount**

4. Slide an appropriately sized o-ring onto your middle finger, or onto both your middle and ring fingers, and secure using the strap on the front of the mount.

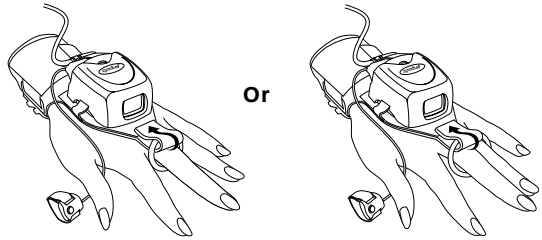



**Figure 5-20. Attaching O-Ring**

5. Pull the hand strap snug, then use the velcro to secure the strap. Place the lip on the front of the terminal mount over the velcro area on the scanner mount to secure the two units together.

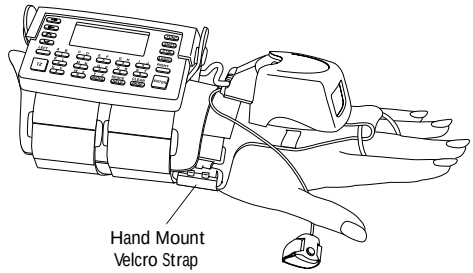



**Figure 5-21. Securing Strap**

6. Wrap the trigger cable around the side of the scanner, next to your index finger, and secure using the velcro loop on the side of the mount.
7. Slide the trigger mount on your index finger, with the button positioned next to your thumb, and adjust the velcro strap.

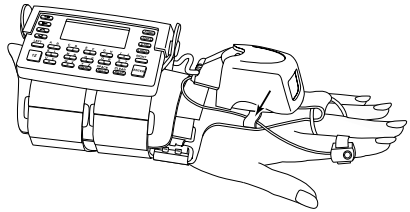
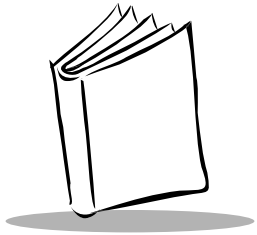


**Figure 5-22. Placing Trigger Mount on Finger**



# Chapter 6
# Operating the WSS 1000

## Power On and Off

Because the WWC 1000 is battery powered, it is important to save power whenever possible. The period of time that the wrist computer can be used before recharging or replacing the battery can be increased by turning the wrist computer off when not entering data.

When powered off, the WWC 1000 saves power by not performing process or display functions. Applications or data in memory are retained. Before the wrist computer powers up, it checks the battery for enough power to ensure reliable operation and data storage. When powered on, the display is restored and processing continues at the point where it was when the wrist computer was powered down.

Powering the WWC 1000 on does not boot the system or initialize either the application or data. For more information regarding initialization, refer to Chapter 3, *Batch and Spectrum One Initialization* or Chapter 4, *Spectrum24® RF Terminal Setup*.

### *Normal Power*

To power the WWC 1000 on or off, press the **Power** button on top of the WWC 1000.

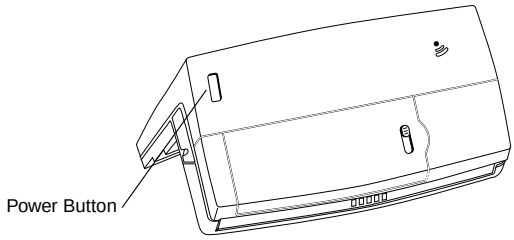



**Figure 6-1. Power Button**

## Automatic Power

A number of other events may turn a wrist computer on or off, depending on the application. Some of these are:

### Power On Via System Control

- The system powers on when a key other than the **Power** button is pressed.
- The system powers on when a scanner trigger is pressed.
- The application powers the system on at a preset time to perform unattended operations such as an overnight communications session.
- The application powers the system on when the wrist computer is placed in the cradle.

### Power Off

The system powers off automatically to conserve power if it is not used for a specific period of time, as determined by the application program.

## Forcing Power Off

If the WWC 1000 freezes in the middle of an operation, pressing the power switch does not power it off. You can force the system to power off, which reduces the drain on the batteries until you can download any collected data to the host system.

To force the system to power off, press and hold the **Power** button for 15 seconds.

Since the WWC 1000 is still frozen at this time, turning the power back on does not solve the problem. To recover the data held in memory, perform a warm boot (refer to *Booting the WWC 1000* on page 6-3).

## Restarting After Forced Power Off

If an operator is forced to power down the WWC 1000 because of defective software, restart the system using the warm or cold boot procedures in the following section.

---

**Note:** *Do not use the power key to restart if the WWC 1000 was forced off due to defective system or application program software in NVM. Pressing the Power button only causes the program to resume where it left off, trying to perform the same unsuccessful operation.*

---

# Booting the WWC 1000

Powering the WWC 1000 on does not boot the system or initialize the program or data. To initialize the WWC 1000, perform either a warm or cold boot.

## Warm Boot

A warm boot resets the operating system while preserving the program and data on the RAM disk. This process is similar to pressing the <Ctrl+Alt+Del> keys on a PC, except that it does not clear the system's memory. To perform a warm boot:

1. Press <**P1**+**ENTER**>.
2. Press and release the **Power** button.
3. Release <**P1**+**ENTER**>.

The WWC 1000 displays a copyright message, RAM size, expanded memory RAM size, etc., depending on the system's configuration.

---

**Note:** *If the battery is removed for a period of time long enough for the supercap to discharge (15 minutes), the wrist computer automatically cold boots upon power-up.*

---

## Cold Boot

A cold boot fully resets the system and clears memory, including the RAM disk. Any programs and data stored in memory or on the RAM disk are deleted. Nonvolatile memory (NVM - the Application EEPROM) is not affected.

*Caution*

This procedure erases all data and programs residing in dynamic memory and RAM disk. All contents of the RAM disk are lost.

To perform a cold boot:

1. Press <**RightArrow**+**ENTER**>.
2. Press and release the **Power** button.
3. Release <**RightArrow**+**ENTER**>.

The wrist computer displays a copyright message, amount of RAM, and expanded memory. Other messages are displayed as well, depending on the system configuration.

## *Cold-Boot Failure*

During a cold boot, the system briefly displays a status line for each driver as it loads in the format:

```
0: Driver     #.##
```

The line shows a status value, usually 0, followed by the name and version number of the driver. If the system halts at one of these lines and displays a status value other than 0, the displayed device driver failed to load properly.

If such a failure occurs, cold boot the wrist computer. If this does not solve the problem, call the Symbol Support Center.

More troubleshooting information is found in the publications listed at the beginning of this manual.

# Boot to Command Mode

Command Mode provides functions for:

- Performing a Program Download to transfer an application program from the host system to the WWC 1000 (refer to *Ending Communications* on page 3-6).
- Running the Self-Test program to verify that the hardware is operating properly (refer to Chapter 7, *Maintainance and Troubleshooting*).
- Performing a Memory Transfer to upload data from the WWC 1000 to the host system (refer to Chapter 7, *Maintainance and Troubleshooting*).

To boot to Command Mode:

1. Press <**ENTER**+**FUNC**>.
2. Press and release the **Power** button.
3. Release <**ENTER**+**FUNC**>.

# Adjusting the Display

## Backlighting

The WWC 1000's backlight illuminates the display in dimly lit areas. The backlight can be turned on in two ways:

- Press <**LAMP**> (**LeftAlpha** and **HELP**).
- Through the application (Interrupt 10h, Function 82h).

The backlight also turns off when the wrist computer is powered off or when an application-set timeout occurs.

## Display Contrast

The LCD display contrast is adjustable, making the display more readable in different lighting conditions, at various temperatures, with different attachments, and at other viewing angles.

To increase contrast (darken) by one step, press <**FUNC** + **SPACE**>.

To decrease contrast (lighten), press <**FUNC** + **BKSP**>.

# The WWC 1000 Keyboard

The keyboard is used for entering data and issuing commands to the WWC 1000. Figure 6-2 illustrates the standard 27-key keyboard.

The keys on the keyboard are distinguished as modifier keys and character keys. Because WWC 1000 keyboards have fewer keys than PC keyboards, each character key can produce more than the usual one or two characters. The modifier keys, **FUNC**, **SHIFT**, **CTRL**, and the Alpha Shift keys, used individually or in combination, determine which character or special function the character keys produce.

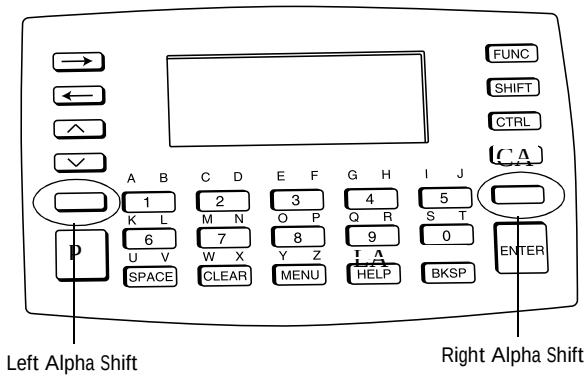



**Figure 6-2. WWC 1000 27-key Keyboard**

## *Auto-Repeat Function*

The keyboard also has an optionally configurable auto-repeat function. If the application allows, a character is repeated as long as the key is held down. If the key is pressed immediately following a modifier key, the modifier sequence affects only the first occurrence of the character key.

## *Modifier Keys*

The **<SHIFT>**, **<Alpha Shift>, <FUNC**>, and <**CTRL>** keys are modifier keys. When pressed individually or in certain combinations, these keys change the keyboard state and possibly the character produced by the character key that is subsequently pressed.

For example:

- Pressing the right or left **<Alpha Shift>** causes the numeric keys to produce the letters listed above them. The left-hand Alpha Shift produces the letters in purple; the right-hand Alpha Shift produces the letters in green.
- Pressing <**Right Alpha Shift**> followed by **<FUNC>** produces Alt characters, the same as the Alt key on a PC.

The modifying effect applies only to the next key pressed.

## Key Descriptions

Most of the keys are self-explanatory. Letter keys produce letters, number keys produce numbers. Keys that perform special functions are described in Table 6-1.

**Table 6-1. Special Keys and Sequences**

| Key Name | Description |
|---|---|
| **SHIFT** | Changes letter and number keys to punctuation marks and symbols. Special combinations include:<br>Following <**Left Alpha Shift**> produces Cap Lock. |
| **Alpha Shift (unlabeled green and purple keys; refer to Figure 6-2)** | Shifts the keyboard to produce alphabetic characters or to modify other key functions when held down. Selectable by the operator. |
| **FUNC** | Function key. Invokes special keyboard functions. Special combinations include:<br>Following <**Right Alpha Shift**> produces the Alt state. |
| **CTRL** | Control key. Generates control characters. Special combinations include:<br>Following <**Right Alpha Shift**> produces Num Lock.<br>Following <**Left Alpha Shift**> produces Scroll Lock.<br><**CTRL** + **BKSP**> is equivalent to CTRL + C. |
| **ENTER** | Usually pressed after typing data or a command. Special combinations include:<br>Following <**Left Alpha Shift**> produces a TAB. |
| **LAMP** | Turns the display light and/or keyboard light on or off. |
| **CLEAR (Escape)** | Depending on the application, completely or partially escapes from an application level or screen, or clears data entered in a field. |

**Table 6-1. Special Keys and Sequences (Continued)**

| Key Name | Description |
|---|---|
| **BKSP** | Following <**Right Alpha**> produces the same result as CLEAR (see above). |
| **MENU** | Defaults to F9, if not otherwise programmed by the application. |
| **F1** | Help key. |

Refer to Appendix B, *WWC 1000 Keyboards* for the characters and operations produced by pressing a sequence of modifier keys on the standard WWC 1000 keyboards. These key assignments can be changed by an application. Refer to your application documentation for any special key assignments.

## *Keyboard State*

The cursor's shape indicates the current keyboard state, unless changed by the application. The standard cursor shapes are shown in Table 6-1.

# Scanning

The WWC 1000 supports several scanning devices, including:

- RS 1 Ring Scanner
- WS 1200 Back-of-Hand Scanner
- Tethered scanners.

If you use a scanner other than the RS 1 or WS 1200 with the WWC 1000, follow its pertinent instructions for installation and operation after verifying that you have the proper cable.

---

**Note:** *Before scanning can occur, the application must implement routines to support bar code scanning. For information on scanning applications, refer to the Series 3000 ADK.*

---

Bar code types (with full autodiscrimination) supported by the WSS 1000 include:

- Code 3 of 9 (standard and full ASCII)
- Code 128
- Interleaved 2 of 5
- UPC Versions A and E (EAN 8 and 13)
- UPC-E1
- Code 11
- Codabar
- Discrete 2 of 5
- MSI/Plessey
- Code 93.

## *Scanning with the RS 1*

To use the ring scanner, power the system and scanner on by pressing the **Power** button or the scanner trigger. To begin scanning:

1. Aim the scanning element at the bar code and press the trigger. The LED turns red to indicate the scanner is on.

2. Adjust the aim so that the thin, red laser beam covers the entire length of the bar code.

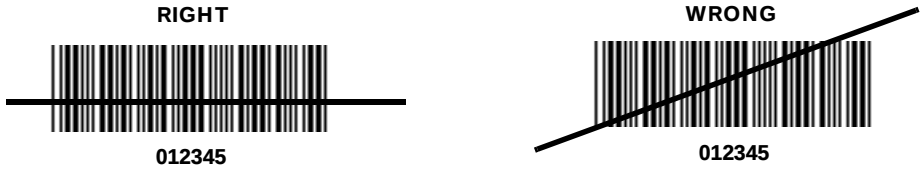



**Figure 6-3. Adjusting the Scan Beam**

3. If the decode is successful, the screen displays the code and the green LED flashes. The wrist computer may also beep.

   The optimal scanning distance varies with bar code density and scanner optics, but most combinations work within 4 to 10 inches.

## *Scanning with the WS 1200 Scanner*

The long range version of the WS 1200 scanner uses an optional aiming dot to assist you in directing the scan beam. If Single Trigger Aim Mode is enabled by the software:

1. Power the WSS 1000 system and scanner on by pressing the trigger or the wrist computer's power button.
2. Press and hold the trigger while aiming the dot at the bar code.
3. Release the trigger. The dot expands to a beam that covers the length of the bar code.

**Figure 6-4. Dot Expanding to Beam**

4. If the decode is successful, the scan LED flashes green and the WWC 1000 screen displays the code. The WWC 1000 may also beep, depending on the application software installed.

When using the standard version of the WS 1200, or if Single Trigger Aim Mode is disabled, only the scan beam appears upon trigger pull. When a bar code is decoded, the scan LED flashes green and the WWC 1000 screen displays the code. The WWC 1000 may also beep, depending on the application software installed.

**Note:** *Scanner use depends on the application. The procedure for your scanner may differ.*

**Table 6-2. LED Indications (Subject to Application Use)**

| Message | Green LED | Red LED |
|---|---|---|
| **Successful Decode** | On | Off |
| **Scanning** | Off | On |
| **Scanner in Blink Mode** | Off | Blinking |
| **Unit Off** | Off | Off |

## *Scanning Considerations*

Usually, scanning is a simple matter of aim, scan, and decode, and a few trial efforts master it. However, two important considerations can optimize any scanning technique — angle and range.

### Angle

Scanning angle is important for promoting quick decodes. When laser beams reflect *directly* back into the scanner from the bar code, this specular reflection can actually "blind" the scanner.

To avoid this, scan the bar code so that the beam does not bounce directly back. But don't scan at too oblique an angle; the scanner needs to collect scattered reflections from the scan to make a successful decode. Practice shows what tolerances to work within.

### Range

Any scanning device decodes well over a particular working range (minimum and maximum distances from the bar code). This range varies according to bar code density and scanner optics.

Scanning within range results in quick, constant decodes; scanning too close or too far away prevents decodes. You need to find the right working range for the bar codes you are scanning. The best way to specify appropriate working range by bar code density is through a decode zone chart. The decode zone plots the scanner's working range as a function of

minimum element widths of bar code symbols. Refer to Appendix A for the RS 1 and WS 1200 decode zones.

# Communications

## Connecting Cable for Data Communications to a Host Computer

1. Plug serial cable (RS-232) into the communication port located on the right side of the back of the single-slot cradle, or on the left end of the 4-slot cradle.
2. Connect the other end of the cable to the serial (COM) port of the host computer, modem, or printer.

---

**Note:** *In most cases, you must use a null-modem cable.*

---

3. Place the WWC 1000 in the cradle. The amber indicator lights.
4. Press the appropriate key on the WWC 1000, as required by the application.
5. The cradle's COM indicator blinks when communications begin.

---

**Note:** *Do not remove the wrist computer while the cradle's COM light is blinking.*

---

6. When communications are complete, the COM light stays on steady.

## Wireless Printing

---

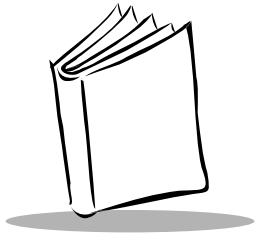
**Note:** *Wireless printing is applicable only to the WWC 1049, and works only with applications modified to support wireless printing such as STEP and TNClient. Any application developer can create an application using wireless printing using the Series 3000 ADK.*

---

The WWC 1049 can perform wireless printing with Comtec's portable printers such as the MP5033 if:

- Print support is included with the application loaded on the terminal.
- The terminal is within range of a supported wireless printer.

Refer to the documentation for your application and to the *Series 3000 Application Development Kit* for more information on printing.



# Chapter 7
# Maintainance and Troubleshooting

## Cleaning

### Wrist Computer

To clean the wrist computer, use a clean, soft cloth dampened with a mild cleaner such as soap and water. Do not use abrasive paper, cloth, or abrasive/corrosive cleaners. Clean the keypad and scanner triggers, and wipe the display window with lens tissue.

### Wrist Mount

Remove the bar from the wrist mount. Hand wash the fabric mount with warm water using a mild detergent and air dry (see tag on mount for washing instructions).

### Ring Scanner

Wipe the scanner window periodically with a lens tissue or other material suitable for cleaning optical material such as eyeglasses.

*Caution*

Do not pour, spray, or spill any liquid onto any part of the wrist computer or ring scanner, particularly the scanner or scan element components.

### Ring Mount

To clean the ring mount, use a clean soft cloth, dampened with a mild cleanser, such as soap and water. Do not use abrasive paper, cloth, or abrasive/corrosive cleaners.

### WS 1200 Scanner

Wipe the scanner window periodically with a lens tissue or other material suitable for cleaning optical material, such as eyeglasses.

*Caution*

Do not pour, spray, or spill any liquid on the scanner.

### WS 1200 Mount

Periodically hand wash the WS 1200's mount in warm water with a mild detergent and air dry.

## Storage

If the system is not going to be used for more than a week, store it in a cool, dry place, away from dust. Remove the battery and repack the wrist computer and scanner in the original shipping container.

For a storage period of a few days, the battery pack can remain in the wrist computer. If the battery is left in the wrist computer for an extended period of time, data stored in memory may be lost. To avoid losing data, keep the batteries charged, and be sure to transfer any data before storing the wrist computer.

## Replacing the WS 1200 Protective Cap

After extended use in harsh environments, the protective cap on the WS 1200 may need to be replaced. To replace the cap that covers the scanner:

1. Remove all cables connected to the scanner.
2. Push up on the recesses between the cap and the scanner (located underneath the scan window) until the tabs on the scanner pop out .

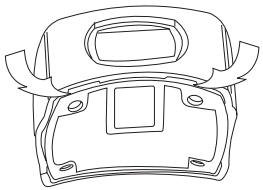


**Figure 7-1. Removing cap**

3. Grip the exposed sides of the scanner and pull the scanner out of the cap.
4. Push the scanner into the back of the new cap so the ports appear through the back opening of the cap.

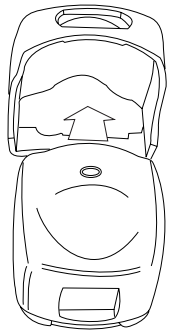


**Figure 7-2. Backing Scanner into New Cap**

5. Push the front of the scanner into the cap until it snaps into place.

**Figure 7-3. Pressing Scanner into Cap**

# Error Messages

If ERR3000 is loaded in the system configuration, the wrist computer displays the following messages to indicate error conditions that affect system performance. A message is usually accompanied by one or more beeps, after which the system returns to its previous status.

The application can change the actual wording of the messages or disable messages. The messages listed in Table 7-1 are representative. Refer to the application's documentation for further information.

**Table 7-1. Error Messages**

| Message | Explanation |
|---|---|
| Low Battery | The battery pack should be recharged or replaced soon. |
| Dead Battery | Replace or recharge the battery pack immediately. After this message is displayed, the system shuts off. You may not be able to power it on again until the battery pack is charged. |
| Power Fault | The last power off was caused by a power failure. This occurs, for example, if the battery pack is removed while the wrist computer is on or the batteries fail suddenly. |

# Communication Status Codes

The program loader status code consists of four hexadecimal digits which indicate whether or not the transfer was successful, and if not, the source of the communications error. A status code of 0000 indicates success; any other code indicates failure.

Table C-1 lists the failures associated with the status codes. The values are additive.

**Table G-2. Communications Status Codes**

| Status Code | Meaning |
|---|---|
| 0002 | Receive overrun error |
| 0004 | Receive parity error |
| 0008 | Receive framing error |
| 0010 | Programming voltage not present |
| 0020 | Data Set Ready or Carrier Detect not detected on open |
| 0080 | ABORT key hit during comm |
| 0100 | Insufficient NVM for image |
| 0200 | Illegal Intel hexadecimal record |
| 0400 | Unsupported Intel record |
| 0600 | NVM EEPROM failed to erase |
| 0800 | Receive time-out error |
| 1000 | Control start character time-out |
| 2000 | Clear To Send inactive time-out error |
| 4000 | Receive buffer full |

# Troubleshooting

## Start-up Failure

Problems are most frequently start-up failures. If cold booting the wrist computer does not start the application successfully, either the application, the system software, or the system is malfunctioning. If you can boot the system to command mode, try the following:

- Use Program Loader to download a new version of the software to NVM. This procedure is described in Chapter 3, *Batch and Spectrum One Initialization*.
- Use Self Test to check system hardware operation. The Self Test procedure is described later in this chapter. After downloading new software, warm boot the wrist computer as described in *Warm Boot* on page 6-3.

## Boot Failure Messages

During a cold boot, the system briefly displays a status line for each driver as it loads, in the format:

```
0:Driver      #.##
```

The line shows a status value, usually 0, followed by the name and version number of the driver. If the system halts at one of these lines and displays a status value other than 0, the displayed device driver did not load properly.

If such a failure occurs, cold boot the wrist computer again. If this does not solve the problem, call the Symbol Support Center.

More troubleshooting information is found in the documentation listed in *Related Publications* on page xi.

## Spectrum24 Terminal

Typical initialization and operating problems and solutions for Spectrum24 terminals are provided in Table 7-3.

**Table 7-3. Troubleshooting Spectrum24 Terminals**

| Problem | Explanation/Action |
|---|---|
| **Out of range** | Terminal is out of the Access Point's range.<br>If you move the terminal during initialization, the terminal may be out of range of the AP and unable to complete the initialization process.<br>Move back in range and repeat the initialization process. |
| **Startup process fails** | Boot server type (BOOTP or DHCP) doesn't exist.<br>Verify that boot server is operating and able to respond to TCP/IP BOOTP or DHCP requests from the terminal. |
| **Low Battery Message** | Place the terminal in a cradle and recharge battery.<br>OR<br>Power terminal off and replace battery. |
| **Battery is dead** | Battery not replaced after receiving low battery message or terminal left on for more than 24 hours.<br>Recharge or replace the battery. |
| **Terminal disassociated from Access Point** | Application does not respond to interactive operations.<br>Applications using internal batch mode continue to function until required to transmit by radio, then fail to work. No message displayed. |

# Self Test Function

The WWC 1000 wrist computer includes a series of self tests which verify that terminal hardware components are operating properly. Run self test if you suspect a problem with the hardware. Except for keyboard testing, no operator input is necessary after selecting a test screen.

## *Running the Self Test*

Access the Self Test function from the Command Mode menu:

1. Boot to command mode (refer to Chapter 6, *Operating the WSS 1000* for boot sequences).
2. On the Command Mode screen, use the **UpArrow** or **DownArrow** to scroll through the options.
3. Highlight Screen Test and press **<ENTER>**.

## *Self Test Summaries*

The Self Test is divided into the following functions or screens:

**Config Screen 1** - Reports the version, time, and date.

**Config Screen 2** - Reports information on the keyboard and display. If a laser scanner is attached, the test reports if the trigger is pulled or not.

**Config Screen 3** - Reports the main battery condition, current power source, and status of the serial ports when a loopback connector is used.

**Memory Screen** - Tests ROM, RAM, and EMS (Expanded) memory, and reports the amount of RAM and EMS.

**Fill Screen** - Fills the entire screen with a test pattern to verify that the entire screen displays.

**Set RTC Screen** - Sets the time and date settings of the real-time clock.

**Serial ID Screen** - Reports the unique identifier for the “flash” memory chip installed in the wrist computer.

### Keyboard Test

Keyboard testing can be performed while the wrist computer displays Config Screen 1 results.

Test any keys except **<Right Alpha Shift>.** When you press a key, the corresponding scan code is displayed on the top row to the right of the test name. For the codes for each key on the 27-key keyboard, refer to the scan codes for the unmodified, right unmodified, and left unmodified keyboards.

### Exiting Self Test

The test loop continues updating the time and battery status and processing keystrokes.

To end the test, press **<CLEAR>** or **<Right Alpha Shift><BKSP>**. The display returns to the Command Mode menu.

## Memory Transfer Program

Command Mode includes a memory transfer utility that transfers data from the wrist computer to a host PC for program troubleshooting. Programmers can analyze an application using tools provided in the Series 3000 Application Development Kit and described in the *Series 3000 Application Programmer's Reference Manual*.

### Cradle Setup

1. Verify that the cradle is properly connected to the PC, as covered in Chapter 2, *Cradle Setup and Battery Charging*.
2. Place the wrist computer in the cradle.
3. Power on the host PC.

### Set Communications Parameters

#### Host

1. Start the Communications program on the host PC.
2. Set up the host communication parameters (these parameters must match the wrist computer's parameters). At the DOS prompt on the host, enter:

```
RCVHEX <filename.hex> <baud rate> <comport#>
```

Typical parameters are:

38400 bps
7 bit data
Odd parity
Xon/Xoff flow control

## Wrist Computer

1. Boot the wrist computer to Command Mode (refer to *Boot to Command Mode* on page 6-5 for the appropriate key sequence).
2. Select the Memory Transfer function from the Command Mode menu. Use **UpArrow** or **DownArrow** to scroll through the command mode options until Memory Transfer is displayed, and press **<ENTER>**.
3. Select the range of memory to transfer by pressing the first letter of the desired range (**A**ll, **R**ange, or **N**one), or use the **UpArrow** or **DownArrow** and press **<ENTER>**.

   If you select **All**, the program skips to the range verification screen (step 7).

   If you select **Range**, the screen displays:

   ```
   RAM
   Use Arrow Keys
   Start       End
   00000      9FFFF
   ```

4. Specify a range of RAM by setting the Start and End addresses.
   - Use **RightArrow** and **LeftArrow** to move the cursor to the digit to be changed
   - Use **UpArrow** and **DownArrow** to change the values.

   Type a range and press <**ENTER**>.
5. Specify a range of NVM to transfer. Choose All or None.
6. If the system has EMS installed, it prompts for the range to transfer (otherwise, the program skips this screen):

   ```
   EMS

   Use arrow keys
   Start         End
   ```

   The range is specified in page numbers (16 KB per page). Use **RightArrow** and **LeftArrow** to move between the Start and End values. Use **UpArrow** and **DownArrow** to change the page number value.

Set the range and press **<ENTER>**.

7. The wrist computer displays a range verification screen. For example:

```
RAM 0000 3FFF
NVM C839 DFFF
EMS   None
Correct?
```

   If the values are correct, press **<ENTER>**. If the values are not correct, press **<CLEAR>** to clear the fields and select new values.

8. Specify the baud rate. Use the up and down arrows to scroll through the list of baud rates until the correct rate is displayed, and press **<ENTER>**. (Flow control may be necessary at 38400 bps and higher.)
9. Specify the data bits. Press **<7**> or <**8>**, or use **UpArrow** and **DownArrow** to display 7 or 8, and press **<ENTER>**.

---

**Note:** *If you select 8 data bits, the program selects No parity and skips the next screen.*

---

10. Specify parity type. Use **UpArrow** and **DownArrow** to display a parity option, or press the first letter of a parity option (**E**ven, **O**dd, **N**one, **S**pace, or **M**ark) and press **<ENTER>**.
11. Set flow control. Use **UpArrow** and **DownArrow** to display the flow control options, or press the first letter of an option (**N**one, **X**on/Xoff, or **R**TS/CTS) and press **<ENTER>**.

## *Start Communications*

1. The wrist computer is ready to send the data to the host PC and displays:

```
Comm Parameters

Start? <ENT>
```

2. Verify that the host is ready to receive data.
3. Press **<ENTER>** on the wrist computer.

   While data is being transferred, the wrist computer displays a report of the 1 KB range being transferred:

```
Memory Transfer

Sending: XXXX
```

The display is updated for every 1024 bytes (1 KB) of memory.

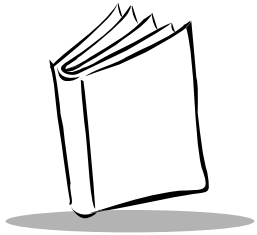
4. When the transmission completes or aborts, the wrist computer displays the transmission status screen:

```
Memory Transfer

Status  0000
```

A status of 0000 (all zeros) indicates that the transfer was successful. Any other status indicates failure. Refer to *Communication Status Codes* on page 7-5 for communications status codes which indicate the source of the error.

## End Communications

To return to the Command Mode main menu, press **<CLEAR>**. Then take whatever corrective action is necessary, and reboot the wrist computer.



# *Appendix A*
# *Specifications*

## Environmental Considerations

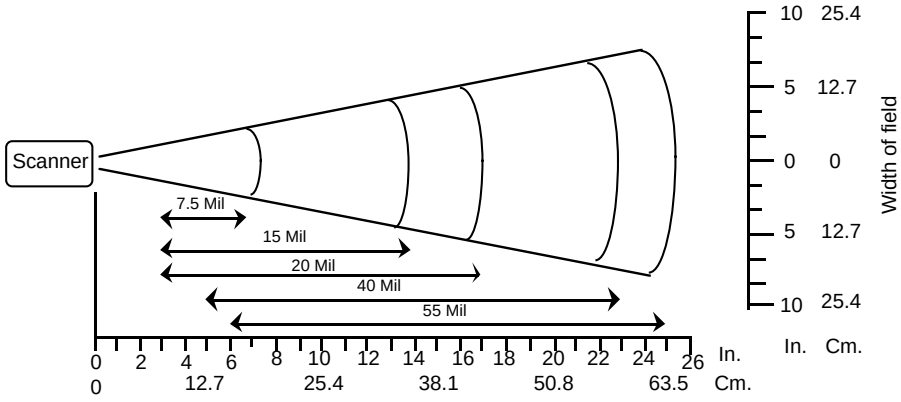
The WSS 1000's operating conditions are listed in Table A-1.

**Table A-1. Operating Specifications**

| | |
|---|---|
| **Operating Temperature** | -20° to 50°C (-4°F to 122°F) |
| **Storage Temperature** | -40° to 60°C (-40° to 140°F)<br>The battery may be stored at -40° C for up to 72 hours. |
| **Humidity** | 5% to 95% non-condensing |
| **Moisture Infiltration Resistance** | Complies with MIL-STD-810D, 506.2, Procedure II-Drip |
| **Altitude** | Operation: 0 to 10,000 feet<br>Storage: Up to 50,000 for 24 hours; rates of change up to 4,000 feet per minute |
| **Mechanical Shock** | 5-foot drop to concrete |

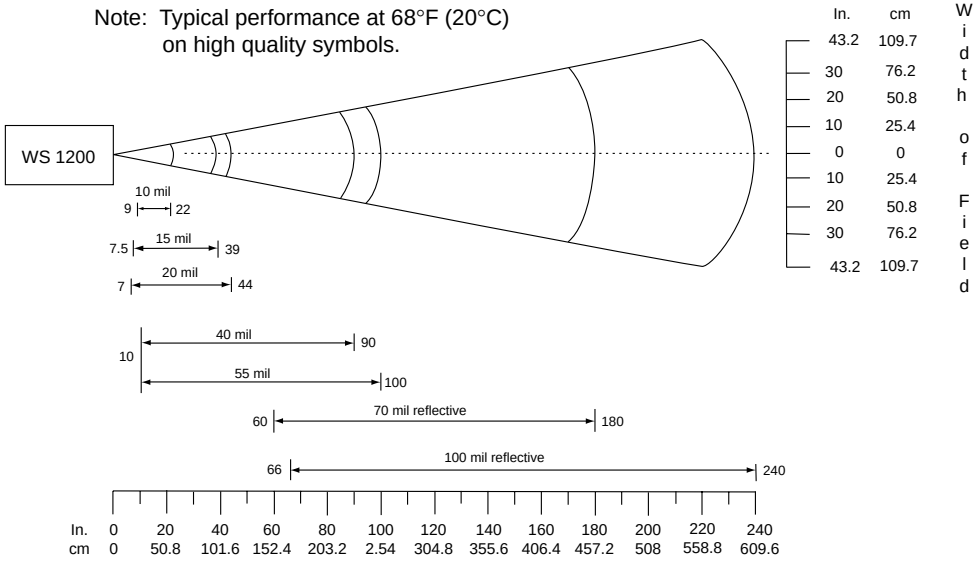
# RS 1 Decode Zone

**Note:** Typical performance at 68°F (20°C) on high quality symbols

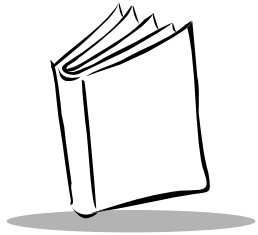



Depth of field as a function of minimum element width

# WS 1200 Decode Zone




Depth of Field



# *Appendix B*
# *WWC 1000 Keyboards*

## Introduction

The WWC 1000 wrist computer has a configurable 27-key keyboard. By combining keystrokes, the keyboard can emulate the full IBM-PC XT keyboard.

This appendix provides the standard keyboard definitions and indicates how key codes are produced on the WWC 1000 wrist computer.

## Keyboard Operation

On a PC, each key generates a scan code. The character code generated by a given key is determined by the scan code and the current keyboard state: unshifted, shifted, control, function, left shift, or right shift. The scan code generated by each key is constant, independent of the keyboard state.

The WWC 1000 keyboard emulates the full PC/XT keyboard using one or more modifier keys in sequence, followed by a character key. The modifier keys are:

Function (FUNC)
Shift
Control (CTRL)
Left Shift
Right Shift

The remaining keys (a through z, 0 through 9, special characters) are called “character keys.”

The character generated is a function of the key scan code and the keyboard state, as on a PC. The main difference is that the scan code generated by a key is also variable, determined by the keyboard state.

# Keyboard Diagrams

The codes and characters generated by each modifier key or sequence are shown in the following figures.

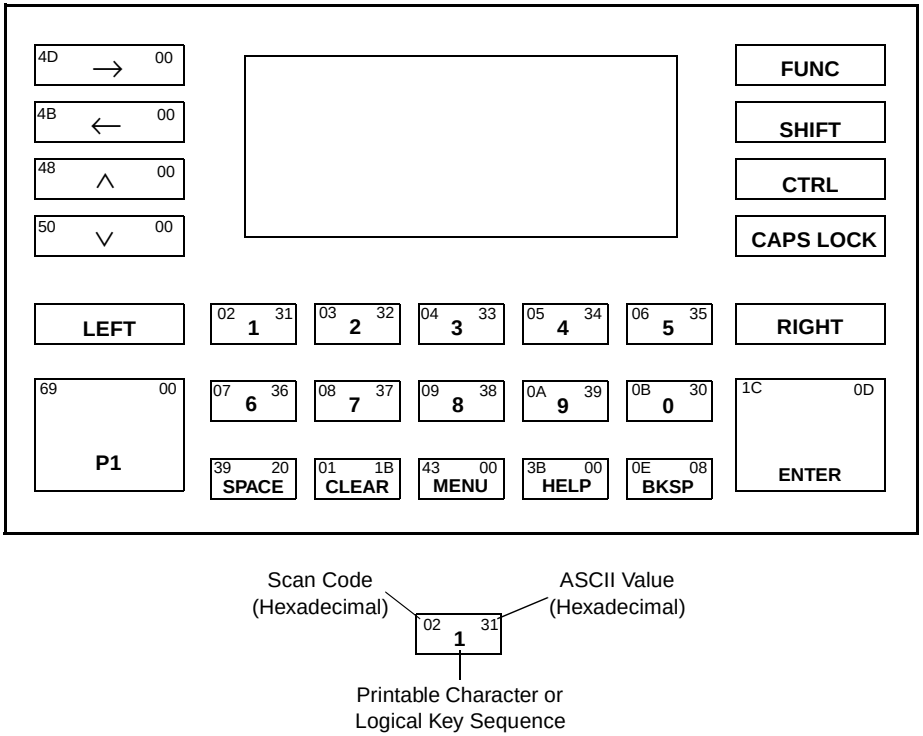



**Figure B-1. Unmodified Keyboard**

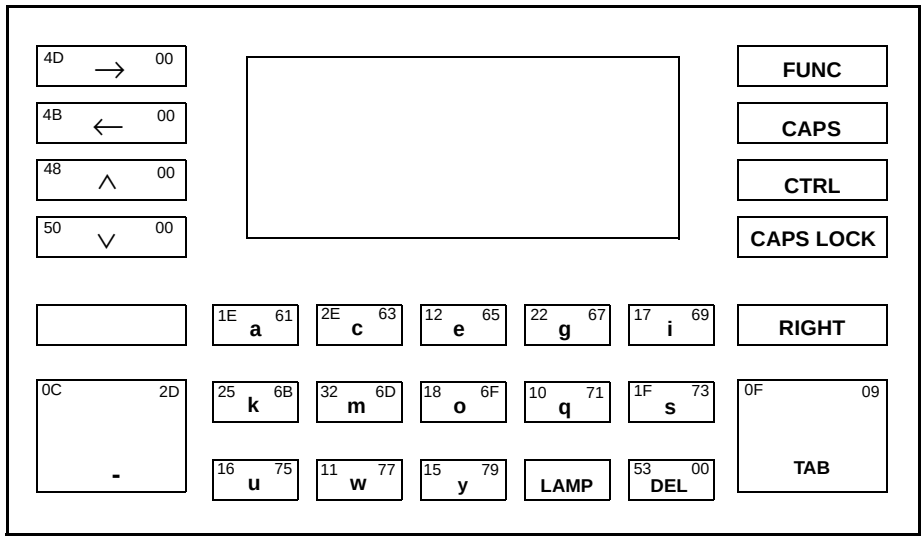



**Figure B-2. Left Unmodified Keyboard**

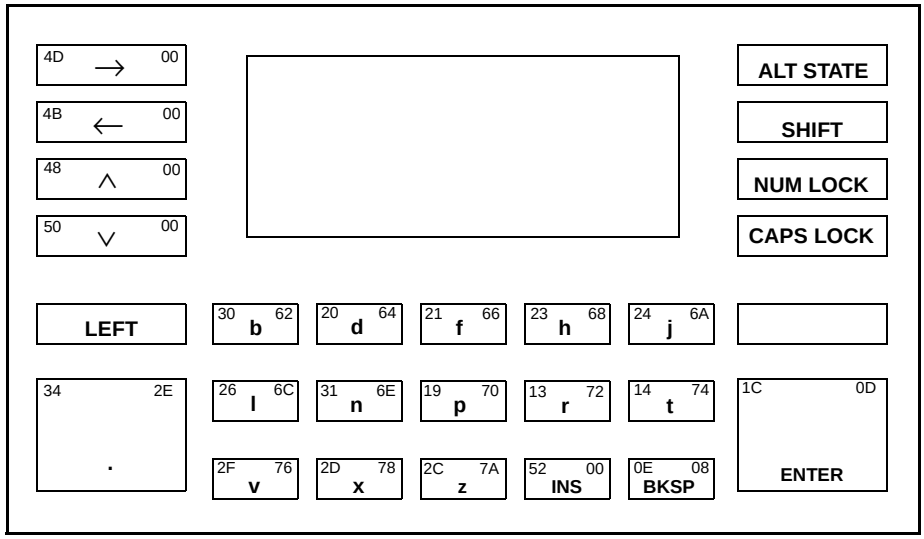



**Figure B-3. Right Unmodified Keyboard**

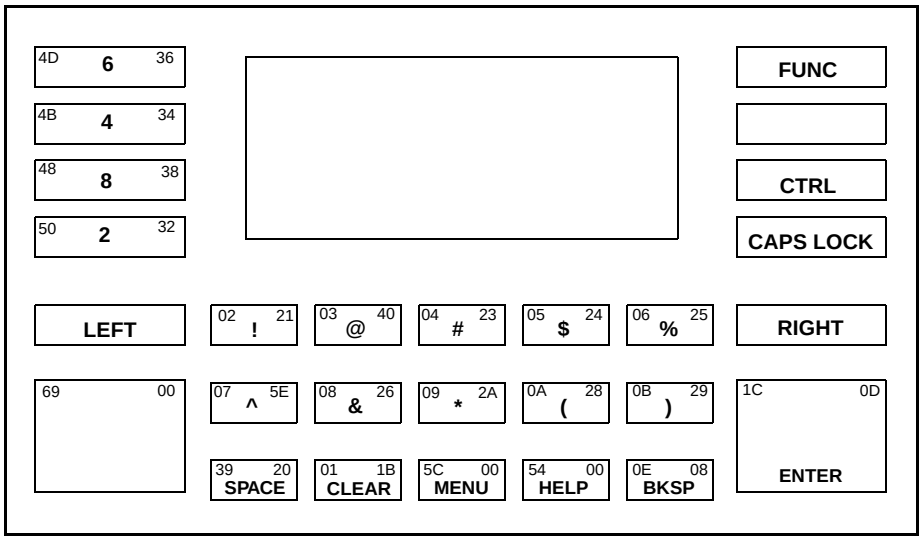



**Figure B-4. Shift Modified Keyboard**

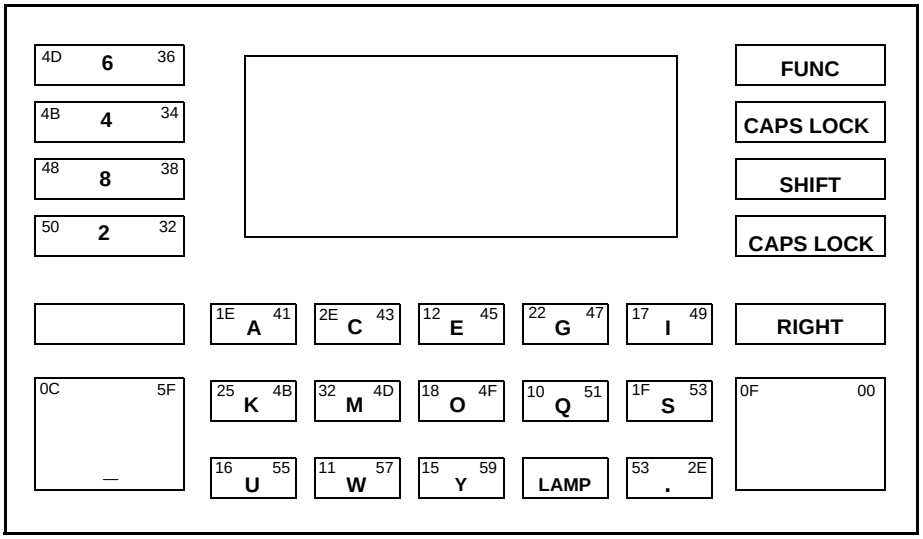



**Figure B-5. Shift Left Modified Keyboard**

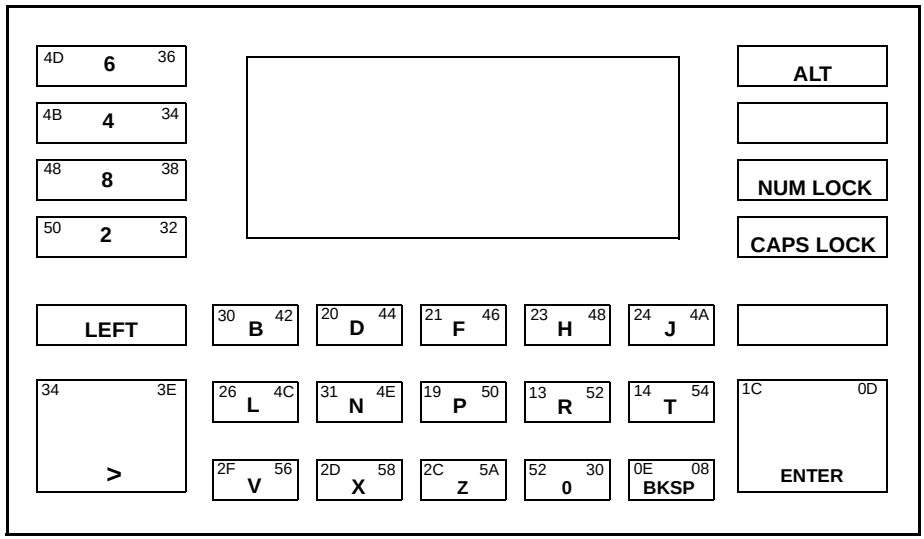



**Figure B-6. Shift Right Modified Keyboard**

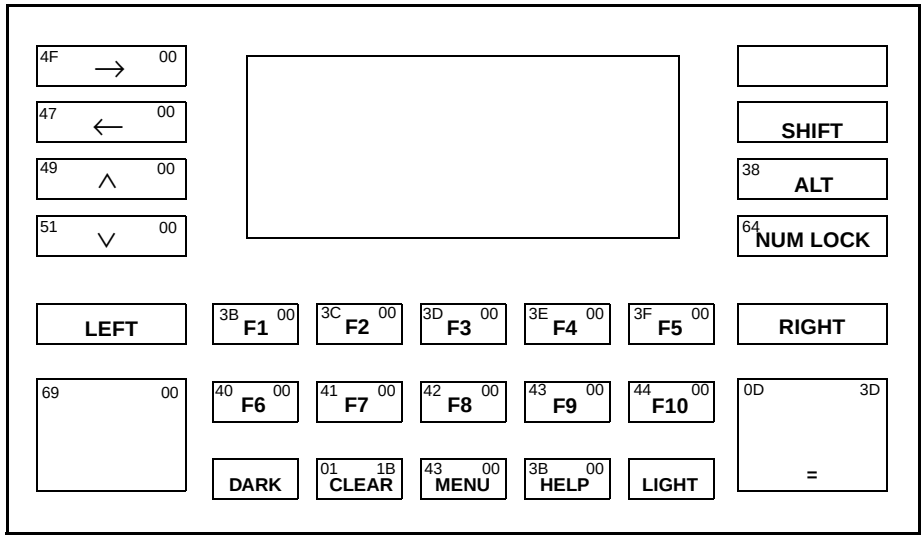



**Figure B-7. Function Modified Keyboard**

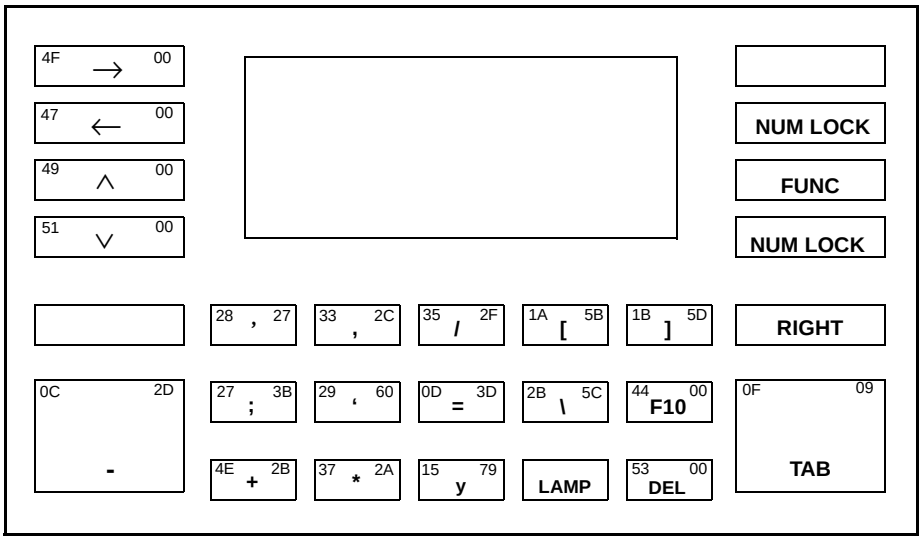



**Figure B-8. Function Left Modified Keyboard**

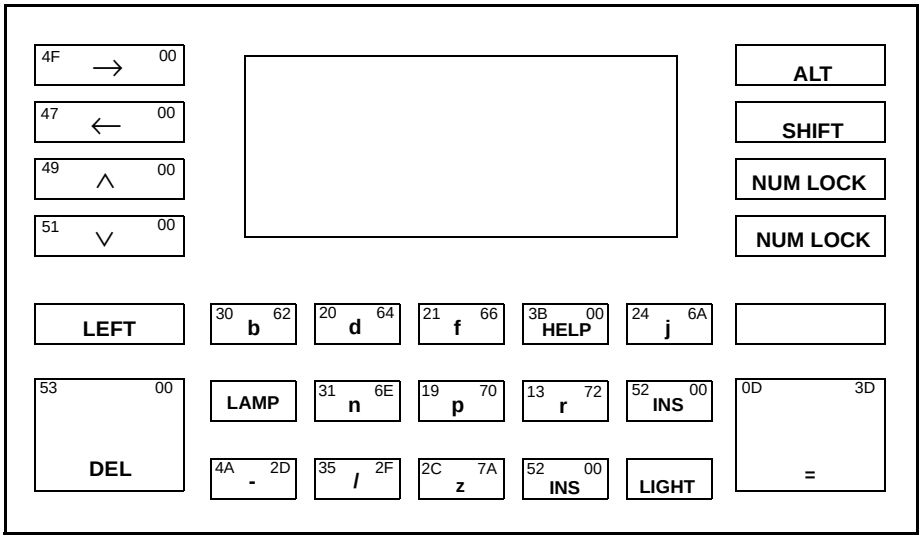



**Figure B-9. Function Right Modified Keyboard**

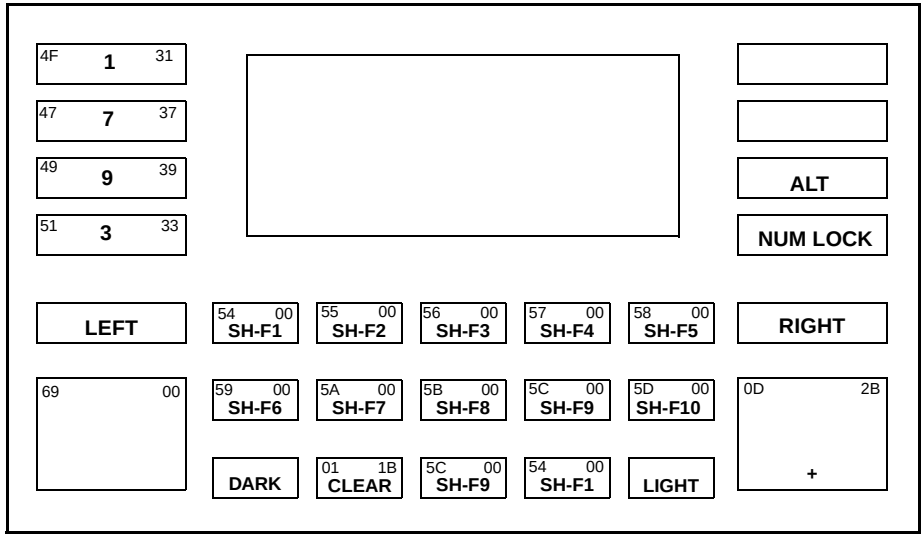



**Figure B-10. Shift-Function Modified Keyboard**

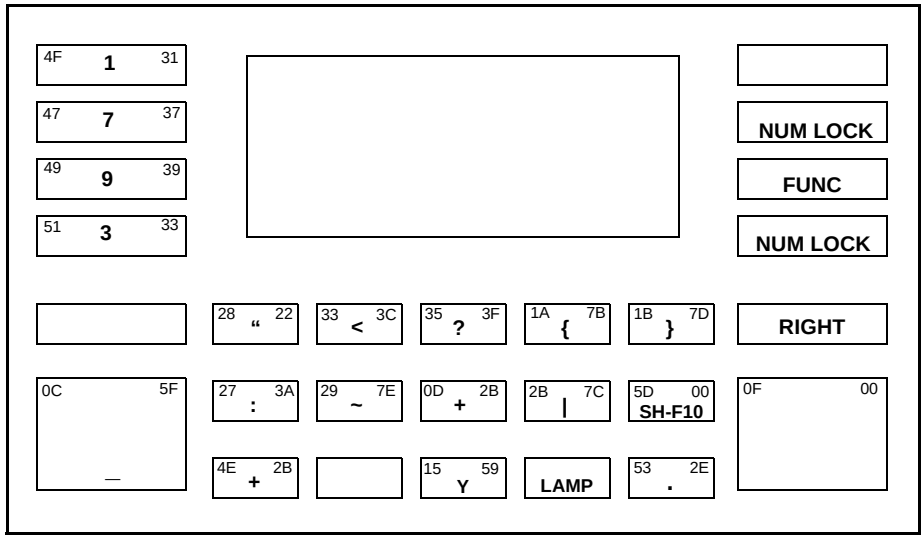



**Figure B-11. Shift-Function Left Modified Keyboard**

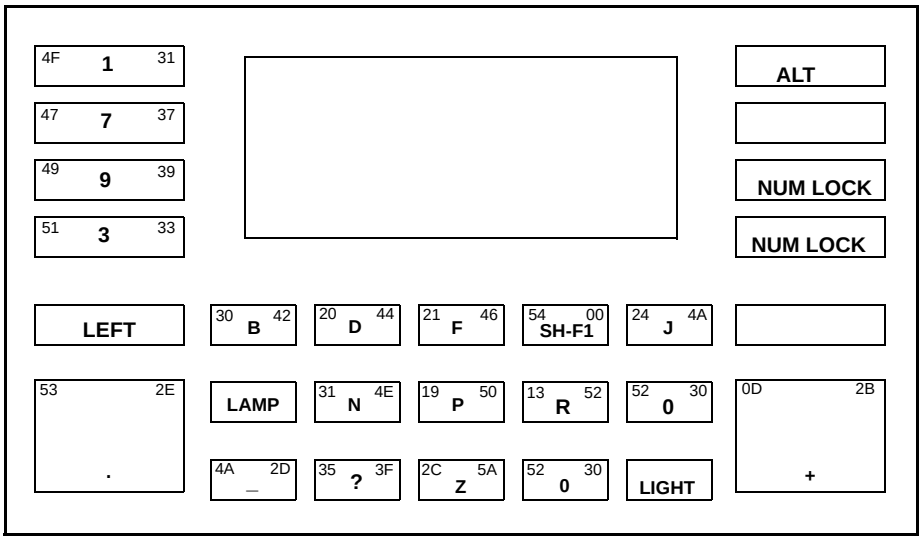
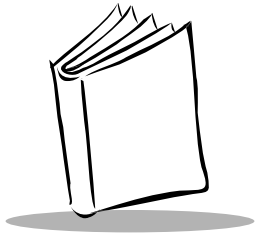



**Figure B-12. Shift-Function Right Modified Keyboard**



# *Appendix C*
# *Spectrum24 Network and Flash Disk Utilities*

## Introduction

Some supplemental utilities are provided for working with the flash disk in addition to the flash disk driver and utilities described in the *Series 3000 ADK* (refer to the section on *FLASHDSK.SYS* in the *Device Driver* chapter of the *Series 3000 Application Programmer's Reference Manual*). These utilities include:

| | |
|---|---|
| **CFG24** | executes from a DOS prompt to change parameters for radio communications. |
| **DIAG24** | executes from a DOS prompt to test radio connectivity and performance. |
| **BOOTP** | is automatically executed by the start-up procedure. Obtains IP address and sets up communications parameters. Should NOT be executed from a DOS prompt. |
| **STAT24** | is automatically executed by the start-up procedure. Indicates the status of the radio connection. Should NOT be executed from a DOS prompt. |
| **FLASH.BAT** | facilitates performing flash disk housekeeping functions, such as copying files to, deleting files from, and renaming files on the flash disk. Executes from a DOS prompt. |

# CFG24

The CFG24 utility enables the terminal operator to configure radio communications parameters. This utility must be run after the radio driver loads because the configuration parameters are saved in the radio card's flash memory, which is accessed using the radio driver services.

This program uses the text message file **MSG.MSG** which is read from the same drive and directory as the CFG24 executable (CFG24.COM). Corrupted screens are an indication that the message file was not found.

To ensure that all changes to parameters entered in CFG24 take effect, re-initialize (warm boot) the WSS 1040 after exiting.

**Note:** *Changes to certain parameters (e.g., Terminal IP Address) do not take effect until the TCP/IP stack is reloaded. Changes to other parameters (e.g., Diversity) do not take effect until the driver is reloaded.*

## *Description*

CFG24 provides menus for editing the radio configuration parameters used to communicate in a Spectrum24 network. These values are saved in a buffer in the radio card's flash memory. The current parameters are set in the file **NET.CFG** on the RAM disk. NET.CFG is used by both the radio driver and the TCP/IP stack to obtain their configuration parameters.

Initially, CFG24 presents the main menu shown in Figure C-1.

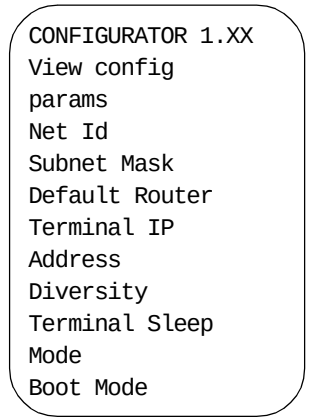



**Figure C-1. CFG24 Main Menu**

The current selectable option appears in reverse video. Because of the WSS 1040's small display, the top and bottom lines are shown, and the remaining lines are viewed by scrolling.

Use the ↑↓ keys to scroll through the options on the menu. Press <**ENTER**> to select an option. Press <**CLEAR**> to exit the menu (from this screen, has the same effect as selecting **Exit**).

1. To view the WWC 1040's default parameters, select VIEW CONFIG PARAMS (Figure C-2).

   This screen is for display only; it is not a data entry screen. Use it to review the terminal's IEEE (or MAC) address, IP address, and Net Id. Press <**CLEAR**> or <**ENTER**> to return to the main menu.

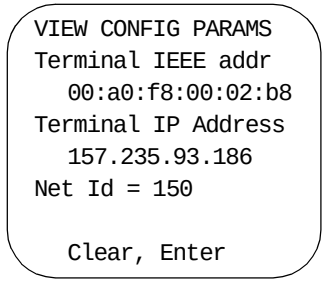



**Figure C-2. View Configuration Parameters Screen**

2. Select **Net Id** from the CFG24 Menu. The *Net Id* screen is displayed.

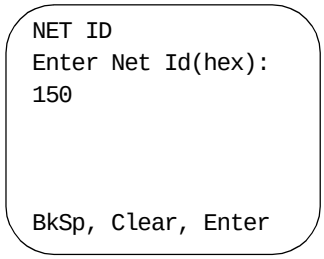



**Figure C-3. Net Id Screen**

The Net Id identifies the radio network and differentiates between different radio networks. All equipment on one network must use the same Net Id.

To change the current Net Id value, backspace over the current value and type a new value, in hexadecimal format, in the range 101 to 1FE. Alphabetical hex values can appear in upper or lower case.

Press <**ENTER**> to effect the change. Press <**CLEAR**> to exit without changes.

3. Select **Subnet Mask** from the main configuration menu. The *Subnet Mask* screen is displayed.

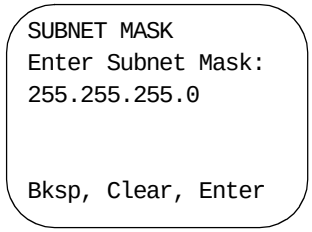



**Figure C-4. Subnet Mask Screen**

To change the current Subnet Mask setting, backspace over the current value and type a new value, in decimal form. Each part of the four-part address must be in the range 0 to 255.

Press <**ENTER**> to effect the change. Press <**CLEAR**> to exit without changes.

4. Select **Default Router** from the main configuration menu. The *Default Router* screen is displayed.

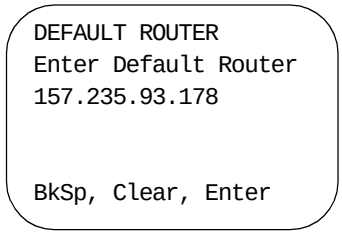



**Figure C-5. Default Router Screen**

The default router address is the address of the node where all packets going to remote networks are sent.

To change the current Default Router setting, backspace over the current value and type a new value, in decimal form. Each part of the four-part address must be in the range 0 to 255.

Press <**ENTER**> to effect the change. Press <**CLEAR**> to exit without changes.

5. Select **Terminal IP Address** from the main configuration menu. The *Terminal IP Address* screen is displayed.

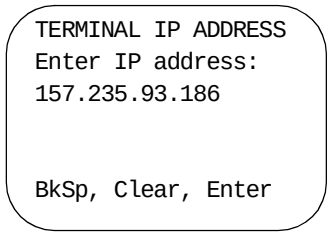



**Figure C-6. Terminal IP Address Screen**

---

**Note:** *Entering a Terminal IP Address is necessary only if IP addresses are not being allocated by a boot server. IP address allocation is part of the BOOTP and DHCP process.*

---

To change the current Terminal IP Address, backspace over the current value and type a new value in decimal form. Each part of the four-part address must be in the range 0 to 255.

Press <**ENTER**> to effect the change. Press <**CLEAR**> to exit without changes.

6. Select **Diversity** from the main configuration menu. The *Diversity* screen is displayed.

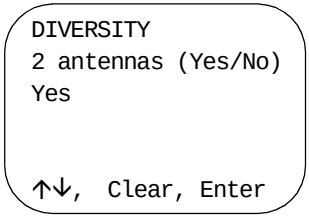



**Figure C-7. Diversity Screen**

If Diversity is set to "Yes", the radio firmware attempts to use both antenna ports for communications. This setting gives better communications if two antennas are being used with the radio, but distinctly worse communications if only one antenna is used. The WSS 1040 has only one antenna; be sure to set Diversity to "No".

To change the current Diversity setting, use the ↑↓ cursor keys to toggle between the settings "Yes" and "No".

Press <**ENTER**> to effect the change. Press <**CLEAR**> to exit without changes.

7. Select **Terminal Sleep Mode** from the main configuration menu. The *Terminal Sleep Mode* screen is displayed.

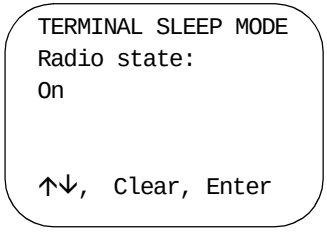



**Figure C-8. Terminal Sleep Mode Screen**

If this switch is set "On", the radio is not powered off when an application powers down the terminal because of inactivity. The terminal can be awakened by a message

directed to it, but not by a broadcast message. If the switch is set to "Off", the radio is powered off when an application powers down the terminal because of inactivity. The default setting is "On".

To change the current Terminal Sleep Mode, use the ↑↓ keys to toggle between the "On" and "Off" settings.

Press <**ENTER**> to effect the change. Press <**CLEAR**> to exit without changes.

8. Select **Boot Mode** from the main configuration menu. The Boot Mode screen is displayed.

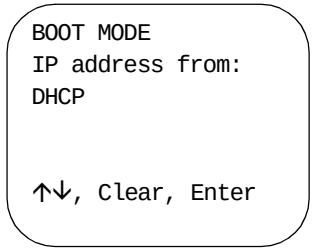



**Figure C-9. Boot Mode Screen**

If boot mode is set to "Manual Entry", no configuration messages are broadcast to the network. The current values of the network parameters which are saved in the radio's flash, are used to connect to the network. "Manual entry" is the default.

If boot mode is set to "Boot" when the WSS 1040 is initialized, a TCP/IP BOOTP request message is broadcast to the network. Any boot servers on the network should respond if configured to do so. The terminal accepts the first valid response received. The response contains an IP address for the terminal's use, and optionally, other network parameters. Parameters received in this BOOTP response override any parameters entered through CFG24.

If boot mode is set to "DHCP" when the terminal is initialized, the process is the same as for BOOTP, except the Dynamic Host Configuration Protocol is used.

Symbol's BOOTP program accepts setting the following network parameters from the BOOTP and DHCP parameters:

Sub-net Mask
Default Router (first address from the router list)
Terminal IP Address

To change the current boot mode setting, use the ↑↓ keys to toggle between the three valid settings.

Press <**ENTER**> to effect the change. Press <**CLEAR**> to exit without changes.

9. Select **Power Management** from the main configuration menu. The *Power Management* screen is displayed.

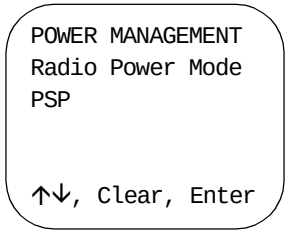



**Figure C-10. Power Management Screen**

If power management is set to PSP (default), the radio is powered up only when there is traffic on the network. This mode adapts to the radio activity to determine how long the radio is powered down. Because the radio is not always in a ready state when a message is sent to it, using PSP mode slows response times.

If power management is set to CAM, the radio is always ready to receive. In this mode, battery life is dramatically reduced. Because the WSS 1040 runs on a Lithium-Ion battery, you can use this method, but it is not recommended.

To change the current power management setting, use the ↑↓ keys to toggle between the two settings.

Press <**ENTER**> to effect the change. Press <**CLEAR**> to exit without changes.

10. Select *Exit* from the main configuration menu and press <**ENTER**> to exit the configurator and get to a DOS prompt.
11. Cold boot the WWC 1040 to re-initialize the terminal with the changed parameters.

# BOOTP

The BOOTP program gets the IP address and sets up communications parameters for use by other parts of the system. How the program works depends on which boot mode setting was selected in CFG24, as follows:

- If "Boot" was selected, a TCP/IP BOOTP request is broadcasted to the network. Boot servers on the network configured to respond send a response. The terminal accepts the first valid response received, which contains a terminal IP address and other network parameters which over-ride any parameters entered through CFG24.
- If "DHCP" was selected, a similar process to the one described for BOOTP occurs, only using the Dynamic Host Configuration Protocol.
- If "Manual entry" was selected, no configuration messages are broadcast to the network and the current network parameters, saved in the radio flash, are used for connecting to the network.

BOOTP uses the text message file **MSG.MSG**, read from the same drive and directory as the executable, **BOOTP.COM.** Corrupted screens are an indication that the message file was not found.

## *Description*

BOOTP is responsible for updating NET.CFG, a standard file used by the TCP/IP software to set communications parameters. In NET.CFG, BOOTP includes any communication parameters returned by a server in the BOOTP or DHCP processes, or sets these parameters as configured through CFG24.

The priority of the various sources of communication parameters is as follows:

1. Any value returned by the BOOTP or DHCP process.
2. Any value entered through CFG24.
3. A previous value used and saved in the radio flash area.
4. The default value for that parameter, located in the original NET.CFG supplied with the system software.

## Output

The following parameters in the radio flash save area are updated if changed by a BOOTP or DHCP process:

| | |
|---|---|
| **Sub-network Mask** | BOOTP or DHCP response may change the sub-network mask.<br>If no change is received from the BOOTP or DHCP response, uses the default of 255.0.0.0. |
| **Default Router** | Default router's IP address. The first router address is saved from the list returned by DHCP or BOOTP. |
| **Terminal's IP Address** | Saved in the radio flash so it is preserved through a terminal re-initialization. |

The following environment variables are set:

| | |
|---|---|
| **YIADDR** | Terminal's IP address in dotted format (e.g., 157.235.93.186). |
| **SIADDR** | Boot server's IP address in dotted format (e.g., 157.235.93.178). |
| **DNSADDR** | Domain name server's IP address. Only the first domain server IP address is saved from the list returned by BOOTP or DHCP. |
| **BTPATH** | File path on server where boot file can be found. |
| **BTFILE** | File name of boot file. |

# STAT24

STAT24 is a Terminate and Stay Resident (TSR) program used to provide the status of the radio connection. It can also be used to check for RF association and alternate actions in batch files depending on the association status. This utility is used mainly to check for associations with an AP when RF difficulties are experienced. Some applications may unload the STAT24 TSR if they cannot afford the program execution space it occupies.

STAT24 uses the text message file **MSG.MSG**, read from the same drive and directory as the executable, **STAT24.COM.** Corrupted screens are an indication that the message file was not found.

STAT24 is loaded during standard start-up procedures. To view the STAT24 pop-up screen (Figure C-11), press the hot-key sequence <**CTRL**+**FUNC**+**1**>.

## *Description*

In the standard terminal initialization procedure, when the system software is loaded and connection to the RF network is attempted, STAT24 is used in two different ways:

- The program loops until the terminal either associates with an Access Point (AP) or times out. The default time-out is 10 seconds.
- The program installs itself as a TSR and provides a hot-key sequence that pops up a display of the current radio connection status and radio quality for the previous minute (refer to Figure C-11). When in this pop-up mode, the program returns to the application screen if any key is pressed.

  **Note:** This program can be unloaded due to application memory constraints, if required.

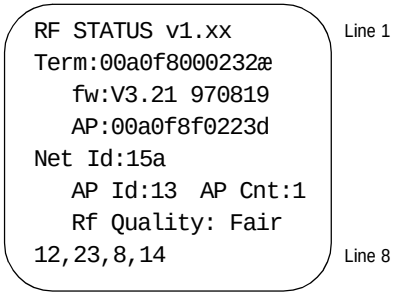



**Figure C-11. STAT24 Screen**

The fields in Figure C-11 are interpreted as follows:

**Line 1** Title and version number of STAT24.

**Line 2** The terminal's IEEE address.

**Line 3** The version and date of the adapter firmware.

**Line 4** The IEEE (MAC) address of the Access Point the terminal is associated with.

**Line 5** The Net Id for the network.

**Line 6** The AP identifier of the AP the terminal is associated with.

**Line 7** A qualitative statement about the radio transmissions over the previous minute. The analysis is simplistic and takes no account of how much other radio traffic there may be. The judgements are essentially for a terminal in a quiet environment: what is poor for a single terminal may be good in a heavy traffic environment. The range of statements is "Good", "Fair", and "Poor".

**Line 8** Four values used to derive the quality judgement provided in line 7. In order, they represent for the last full minute:

- Total packets transmitted
- Total packets received
- Percent error packets transmitted
- Percent error packets received.

# DIAG24

DIAG24 is used in two situations:

- As a connectivity tool, using a ping that is not re-tried on transmission errors. This test is intrusive as pings are sent as fast as possible.
- As a diagnostic tool for potential radio problems. It can eliminate or confirm that the traffic problems are in the radio portion of the network. The round-trip time reported during the test indicates the portion of the transaction response time that is attributable to the radio network.

This program uses the text message file **MSG.MSG** which is read from the same drive and directory as the executable (DIAG24.EXE). Corrupted screens are an indication that the message file was not found.

## *Description*

To run DIAG24 on a WWC 1040:

1. At a DOS prompt on the terminal, type:

   ```
   DIAG24
   ```

   and press <ENTER>. The following menu displays.

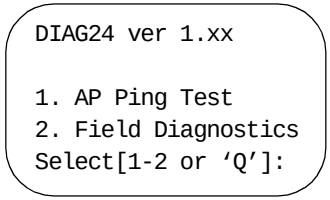



**Figure C-12. DIAG24 Screen**

2. Press either (1) AP Ping Test or (2) Field Diagnostics. Press **Q** to quit.

The set-up menus that follow are the same as the mode selected from the DIAG24 menu. The title line of the first screen indicates the selected test mode: AP PING TEST for selection 1; FIELD DIAGNOSTICS for selection 2.

```
      <Test Mode>
1. Roaming Enabled
2. bb--eeeeeeeeeeee
3. bb--eeeeeeeeeeee
   :     :     :
   :     :     :
n. bb--eeeeeeeeeeee
Select [1-n or 'Q']:
```

**Figure C-13. Test Mode Screen**

3. Select the roaming mode. For each AP listed by line number:

| | |
|---|---|
| **bb** | represents the AP identifier (or BSS identifier). |
| **eeeeeeeeeeee** | is the 48-bit MAC address of the AP in hexadecimal notation. |

- If you select Roaming Enabled, the terminal pings the associated AP and roams as required between APs.
- If you select a specific AP in the list, the test is conducted solely with that AP.
- If more APs are in range than can fit on one screen, the last selection is "More". Select this to present more APs for selection.

4. To exit the screen, select **Q** or press <**CLEAR**>.

```
      <Test Mode>
MESSAGE SIZE
1. 100 bytes
2. 256 bytes
3. 512 bytes
Select[1-3 or 'Q']:
```

**Figure C-14. Ping Message Size**

5. Select the ping message size by pressing the corresponding number, and advance to the next screen.

   Press **Q** or <**CLEAR>** to return to the main menu.

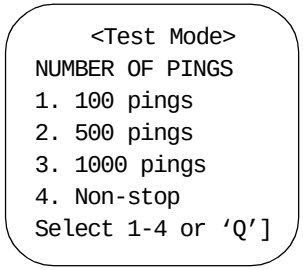



**Figure C-15. Number Of Pings Screen**

6. Select a counter for the number of test iterations in the *Number of Pings* screen by pressing the corresponding number, and advance to the next screen.

   Press **Q** or <**CLEAR>** to return to the main menu.

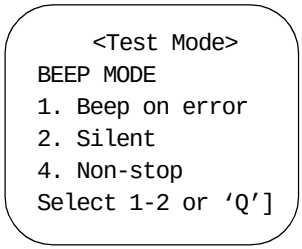



**Figure C-16. Beep Mode Screen**

7. Select whether to sound a beep if an error is encountered by pressing the corresponding number to make the selection and advance to the test screens.

   Press **Q** or <**CLEAR>** to return to the main menu.

## Ping Tests

During an AP ping test, the following screen is displayed and continuously updated.

```
      AP PING TEST
A Cnt  Err  AP  RS
   56    2  04  36
   57    2  04  36
   58    3  04  36  TMO
   59    3  04  36
   55    2  04  36
  Press 'Q' to Quit
```

**Figure C-17. AP Ping Test Results**

Each ping displays a new line which shows the cumulative ping count, error count, AP identifier of the AP the terminal is associated with, and the RSSI value of the terminal reception. If there was an error, an indicator appears at the right end of the line (see line 5 in Figure C-17). The report wraps around so that, at any given time, the last five message reports are visible.

The 'A' at the left of line 2 in Figure C-17 indicates that the terminal is associated with an AP. A 'U' indicates that the terminal is not associated.

When the ping test is running in non-stop mode, if either of the count fields overflows, the first detail line is pre-empted to show the most significant digits of the count, prefixed with an asterisk (Figure C-18).

```
      AP PING TEST
A Cnt  Err  AP  RS
*   6  * 2  04  36
   57    2  04  36
   58    3  04  36  TMO
   59    3  04  36
   55    2  04  36
  Press 'Q' to Quit
```

**Figure C-18. AP Ping Test Results (Non-Stop Mode)**

In Figure C-18, the first detail line reads "*6*2..." showing that the real values for the counters in the second and subsequent detail lines are 600, 057, and 2,002.

Press <**Q>** or <**CLEAR**> to terminate the test and return to the DIAG24 menu.

```
     AP PING TEST
Total secs = 7.4
Pings = 100
Packet size = 100
Retries = 0
Timeouts = 4

[R}epeat or [Q]uit
```

**Figure C-19. AP Ping Test Summary**

When the ping test stops, the summary screen (Figure C-19) displays, showing the elapsed time of the test, total pings transmitted, packet size used, retry count, and number of timeouts. To repeat the test with the same parameters, press <**R**>.

Press <**Q>** or <**CLEAR**> to terminate the test and return to the DIAG24 menu.

## *Field Diagnostics*

During a field diagnostic test, the following screen is displayed and continuously updated.

```
    FIELD DIAGNOSTICS
A Cnt Err   Rty ms  AP
   56   2    0 165  52
   57   2    0  55  52
   58   3    1 TMO  52
   59   3    0 220  52
   55   2    0  55  52
  Press 'Q' to Quit
```

**Figure C-20. Field Diagnostics (Screen 1)**

Each ping displays a new line which shows the cumulative ping count, error count, retry count for this message, round-trip time in milliseconds for this message or indication of error type if there was an error, and the AP identifier of the AP that responded to the message.

When the test stops, a summary screen is displayed.

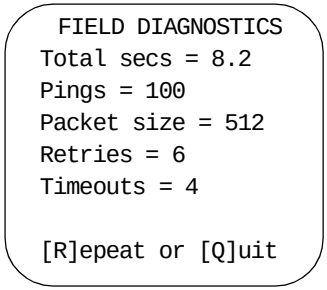



**Figure C-21. Field Diagnostics Summary Screen**

Press <**Q>** or <**CLEAR**> to terminate the test and return to the DIAG24 menu.

# FLASH.BAT

The FLASH.BAT utility facilitates copying files to and deleting files from flash disk, and renaming files on the disk. The batch file switches to write mode on flash disk and restores read-only mode after the operation.

## *Deleting Files from Flash Disk*

To delete files, use the command:

```
FLASH DEL <filename>
```

For example:

```
FLASH DEL CS1.CFG
```

deletes the Spectrum One compatibility layer configuration file, CS1.CFG, from the current directory of the flash disk, and

```
FLASH DEL \*.*
```

deletes all files in the flash disk's root directory.

---

**Note:** *There is no mention of the E: drive in the command.*

---

## *Copying Files to Flash Disk*

To copy files to flash disk, use the command:

```
FLASH COPY <filename> \
```

For example:

```
FLASH COPY NET.CFG \
```

copies NET.CFG, the protocol stack configuration file, from the current directory (normally D:) to the root directory on flash disk, and

```
FLASH COPY E:\SVTP\CS1.CFG \STEP
```

copies CS1.CFG from the SVTP directory on flash disk to the STEP directory on flash disk.

**Note:** *In the second example, the E: drive must be mentioned on the first command parameter, but is assumed on the second parameter and must NOT be mentioned.*

## *Renaming Files on Flash Disk*

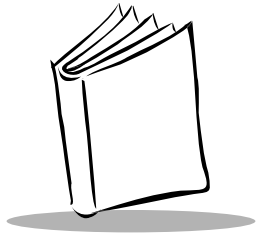
To rename files on the flash disk, use the command:

```
FLASH REN \<OLD FILE NAME> <NEW FILE NAME>
```

For example:

```
FLASH REN \NETCFG.1 NET.CFG
```

renames NETCFG.1 in the flash disk's root directory to NET.CFG. The standard restrictions on renaming files apply, e.g., NETCFG.1 must exist and NET.CFG must not exist in the directory before the command is executed.



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What topics need to be added to the index, if applicable?_____

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